Efficiency of South African municipalities in utilising infrastructure assets in addressing water and electricity service delivery challenges.

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ABSTRACT

The demand for the efficient provision of basic services is expected in the public financial management system in a resources-constrained environment. Municipalities in South Africa have failed to distribute resources or deliver services to communities efficiently. The current demand for basic services exceeds the current supply. This is supported by ongoing services delivery protests and is an indication of the huge backlogs in the provision of water, sanitation, solid waste and electricity services. This study analyses the efficiency of asset utilisation in fulfilling business objectives specifically related to water and electricity service delivery between 2016 and 2018. The research conducts a financial analysis using the return on asset (ROA) ratio. Correlation analyses and regression analyses calculate the ROA efficiency gap between certain municipalities and selected private sector industries. Evidence emerging from the data analysis indicates that while a positive mean does exist, municipalities tend to function on different efficiency levels. Nearly 50 percent of municipalities reflected a decrease in efficiency levels between 2016 and 2018. When comparing the municipal ROA ratios to selected capital-intensive private sector businesses, the efficiency gap is significantly large. This indicates that substantial reforms are required within municipalities should they wish to focus on business-like efficiency.

Keywords and phrases

Return on asset ratio, efficiency ratio, water and electricity, service delivery, South African municipality's financial position and financial performance, infrastructure assets and financial statement analysis

OPSOMMING

In 'n omgewing met beperkte hulpbronne is die aanvraag na die doeltreffende voorsiening van basiese dienste in die openbare finansiële bestuurstelsel verwag. Suid-Afrikaanse Munisipaliteite kan nie hulpbronne doeltreffend versprei of genoegsame basiese dienste aan gemeenskappe lewer nie. Die huidige aanvraag na basiese dienste oorskry die huidige voorsiening. Dit word gedemonstreer deur voortdurende betogings oor dienslewering en is 'n aanduiding van die groot agterstande in die voorsiening van water, sanitasie, vaste afval en elektrisiteitsdienste. Hierdie studie ontleed die doeltreffendheid van bate aanwending in die vervulling van die besigheidsdoelwitte ten opsigte van water en elektrisiteits dienslewering tussen 2016 en 2018. Hierdie navorsing doen 'n finansiële ontleding met behulp van die opbrengs op bates (ROA) verhouding. Korrelasie-ontledings en regressie-ontledings bereken die ROA-doeltreffendheidsgaping tussen sekere munisipaliteite en geselekteerde privaatsektorbedrywe. Die resultate van die data-ontleding dui daarop dat alhoewel 'n positiewe gemiddelde wel bestaan, munisipaliteite geneig is om op verskillende doeltreffendheidsvlakke te funksioneer. Bykans 50 persent van die munisipaliteite weerspieël 'n afname in doeltreffendheidsvlakke tussen 2016 en 2018 . Wanneer die munisipale ROA verhoudings met geselekteerde kapitaalintensiewe ondernemings in die private sektor vergelyk word, is die doeltreffendheidsgaping aansienlik groot. Dit dui daarop dat wesenlike hervormings binne munisipaliteite vereis is as hulle op besigheidsagtige doeltreffendheid wil fokus.

Sleutelwooorde en -frases:

Opbrengs op bate verhouding, doeltreffendheidsverhouding, water en elektrisiteit, dienslewering, die Suid-Afrikaanse munisipaliteit se finansiële posisie en finansiële prestasie, infrastruktuurbates en finansiële state-ontleding

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ABBREVIATIONS AND ACRONYMS

AFS	Annual Financial Statistics survey
DEA	Data Environmental Analysis
FCM	Financial Census of Municipalities
GDP	Gross Domestic Product
GRAP	Generally recognised accounting practices
NDP	National Development Plan
PPE	Property, Plant and Equipment
PPF	Production Possibility Frontier
RDP	Reconstruction and Development Programme
ROA	Return on Assets
STATS SA	Statistics South Africa
TSWE	Total Sales Water and Electricity
TCVTWE	Total Carrying Value Total Water and Electricity

CHAPTER 1: INTRODUCTION

Pacione (2009) indicates that places are special sites in space where people live, work and where they are likely to form intimate and enduring connections. The utilisation and management of physical assets contained in these places are critical to the prosperity of life. These physical infrastructure assets are essential for the distribution of resources and basic services such as water and electricity, sewerage and sanitation to communities. These assets are critical to an extent that the success and progress of human society depend on these assets, including a nation's economic strength is reflected in its infrastructure assets (Uddin, Hudson, & Haas, 2013). The study therefore analyses the how effectively South Africa municipalities utilises its infrastructure assets in providing water and electricity services.

While achievements related to improving infrastructure assets and access to basic services have been many since 1994, Bernstein (2019) argues that the country is regressing when compared to global competition and concerning its requirements and ambitions set out in the Constitution and the National Development Plan (NDP). This is evident in local government service delivery protests, that have taken violent forms and is now almost a regulate feature of the national landscape. The increase in local government protests is an indication that municipalities have failed to deliver the objectives of the constitution and as a result and failed to ensure that economic benefits accrue to local government institutions. These key municipal objectives or areas of responsibilities include providing an accountable government for local communities, ensuring services are sustainably provided to communities, promoting social and economic development and promoting a safe and healthy environment (Republic of South Africa, 1996a).

Schalkwyk (2008) indicates that the failure of municipalities to delivery according to their constitutional requirements is because of insufficient capacity, inadequate financial resources and the lack of efficient utilisation of infrastructure assets including the maintenance and installation of infrastructure. The challenges faced by municipalities arise due to service delivery failures stemming from huge backlogs, inadequate revenue collection, corruption and fraud, poor financial management of assets and a lack of human capacity (Monkam 2014). While the public demands and expect a high quality of service and continuous improvement to infrastructure, regulators often want to limit the spending on infrastructure and maintenance costs (Shah, Mcmann, & Borthwick 2017).

In an environment facing budget constraints and increasing public demand attention is turning to capital efficiency (The Economist Intelligence Unit, 2014). The problem of inefficient utilisation of infrastructure assets to fulfil business objectives and goals can only be solved through human action within the context of the real world (Moutin, 2001). Thus, agencies that are seeking new measures and processes to manage their infrastructure assets more effectively (Schraven, Hartmann, & Dewulf, 2011). However, little is known about how to apply effective asset management in public infrastructure, which seems to be more challenging.

In the research, the study focuses on analysing the efficiency of asset utilisation in fulfilling business objectives specifically related to water and electricity service delivery. Efficiency comparisons are conducted between municipalities and private sector enterprises operating within South Africa. The analysis is based on a financial analysis of the return on assets financial ratio calculated for from municipalities and private sector entities between the period 2016 and 2018. The research addresses areas relate to which efficiency indicators or guidelines should be used, what the efficiency levels of municipalities and selected private sector businesses are, and finally the size of the efficiency gap between private sector and public sector.

The research aims to determine the relationships between variables associated with property, plant and equipment specifically carrying value of infrastructure assets and revenue generated by these assets, the efficiency within municipalities with regard to infrastructure asset utilisation and to determine the efficiency gap that exists between municipalities and selected private sector businesses. The ultimate aim is to determine efficiency within municipalities by conducting a financial comparison across relevant municipalities based on the return on assets ratio.

It is essential to undertake a study of this nature so that relevant and meaningful answers will be obtained for the main research questions. In conjunction with the empirical results, the literature review will determine the significance of inefficiencies related to infrastructure asset utilisation by municipalities. The study will include a financial analysis of information related to the financial position and financial performance of municipalities. In determining the significance of inefficiency, comparisons between municipal financial information and private sector financial information will be conducted.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

Governments across the world are under constant pressure to improve the quality of public services while containing costs and enhancing public accountability at the same time. There is a growing movement to overhaul and align government financial management, accounting practices, reporting and accounting systems with private-sector business models (Ball, Dale, Eggers, & Sacco, 1999). This movement mainly directed at improving efficiency, effectiveness, and accountability in the public sector. Uddin et al., (2013) indicates that the utilisation and management of assets are critical to the prosperity of life. These tangible assets determine the quality of life, wealth retention, status recognition, class allocation of an individual in society and, productivity and profitability of businesses utilising infrastructure assets.

The importance of infrastructure assets is further justified by an investigation conducted by Ruch & Geyer Jr (2017). The study investigates the link between public sector capital investment and economic growth. It was determined that infrastructure development has a significant positive impact on economic growth. Countries included in the examination indicated a proportionate increase of one percent in Gross Domestic Product (GDP) and a corresponding increase in infrastructure, reinforcing growth as mutually inclusive. The research also indicates that investment in infrastructure reduces transaction and production costs, creating employment, enhancing education and healthcare and improving environmental conditions.

This chapter represents a literature review focusing on financial efficiency and management within the public sector specifically related to municipal infrastructure assets. Specific areas of focus include legislative and policy frameworks governing municipal financial management, the functions and evaluative principles of municipalities, concepts related to asset management, efficiency principles of infrastructure asset management and finally review the financial health of municipalities.

2.2 FINANCIAL MANAGEMENT: LEGISLATIVE AND POLICY FRAMEWORKS

Sound financial management is essential to the long-term sustainability of local government institutions. These financial management practices underpin the process of democratic accountability. The objective of sound financial management is to improve efficiency, effectiveness, and accountability in the public sector (Grubisic, Nusinovic, & Roje, 2009). Weak or opaque financial management results in the misdirection of resources and increases the risk of corruption (National Treasury, 2011). The management of municipal assets is central to providing the required services in a cost-effective, efficient and transparent manner. Effective asset management should maximise the service potential of existing assets by ensuring that they are appropriately used, optimise the life cycle costs of owning including using these assets, reduce the demand for new assets through optimal use of existing assets, and establish clear lines of accountability and responsibility for performance (National Treasury, 2004).

The public sector asset management is regulated by various legislative and policy frameworks, which prescribes the rights of municipalities over non-current assets, their obligations, and procedures to ensure efficiency, effectiveness, and accountability. Encouraging efficient public sector management has become one of the prevailing issues in public sector practices (Grubisic et al., 2009; Wise, 2002). An adequate understanding of the various legislative and policy frameworks, which articulates the service delivery mandate of municipalities, is critical because it provides a basic understanding of the context within which the notion of performance within municipalities should be understood and contextualised (Manyaka & Sebola, 2015).

The framework regulating municipal financial management and asset management practices originates from the constitution of South Africa. The constitution provides a legal foundation that sets out the rights and duties of citizens and defines the structure of the Government. The constitution (Republic of South Africa, 1996b) explicitly indicates that a municipality must structure and manage its administration, budgeting and planning processes to give priority to the basic needs of the community including promoting social and economic development. This implies that asset management forms a component within the administration, budgeting and the planning thereof should align with the basic needs of the community. As per the constitution, local government is to provide a democratic and accountable governance for local communities,

to ensure the sustainable provision of services to communities, to promote social and economic development and to promote a safe and healthy environment. These objectives result in the establishment of measures to ensure both transparency and expenditure control in each sphere of government.

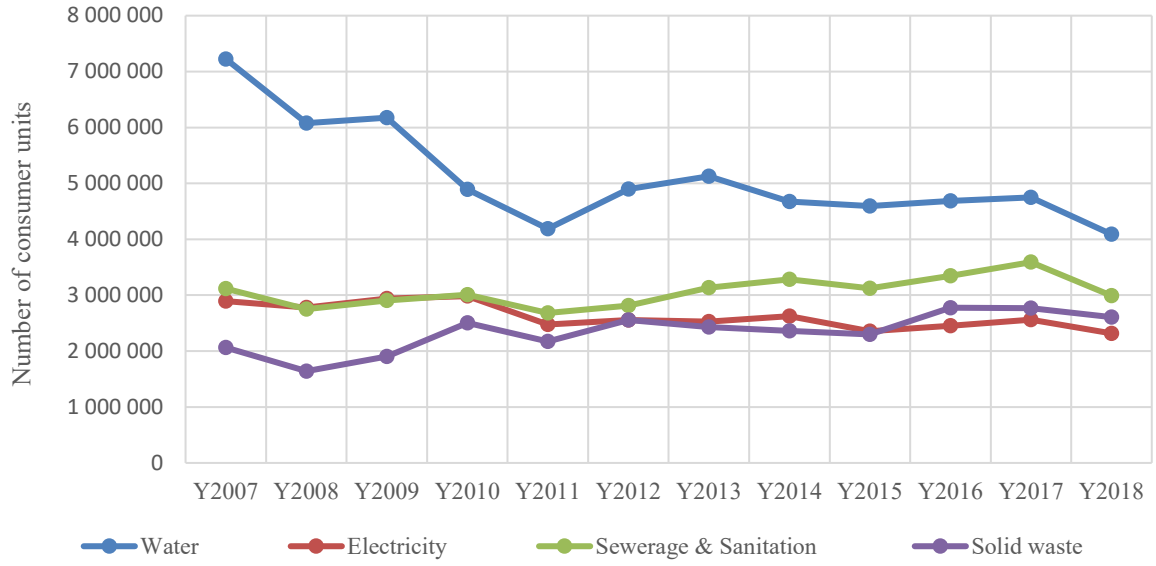
The introduction of the public financial management act (No. 1 of 1999) and the municipal finance management bill (No. 56 of 2003) results in increased accountability for proper asset management (Daya, 2004). The public financial management act prescribes general responsibilities for accounting officers for the economical and transparent use of the resources. This ensures the safeguarding and maintenance of assets (National Treasury, 2010). Closely aligned with the public financial management act, the municipal financial management act involves managing a range of interrelated components: planning and budgeting, revenue, cash and expenditure management, procurement, asset management, reporting and oversight (National Treasury, 2011). These policies establish norms and standards of conduct for ensuring transparency, accountability and appropriate lines of responsibility. They further ensure that the management of municipal assets and liabilities are in accordance with standards of generally recognised accounting practices (GRAP) and maintains a system of internal control of assets (Republic of South Africa, 2004).

2.3 FUNCTIONS OF MUNICIPALITIES

The actual functioning of municipalities is to ensure that all citizens, especially the poor have access to basic services. Reference is made to the poor and vulnerable groups, as there is a general agreement that due to their economic conditions the poor cannot afford to pay the full price of essential services. Basic essential services include water, electricity, sanitation, housing and a basket of free basic services has been operation since 2001 (Schalkwyk, 2008). Service delivery regarding the provision of water and electricity can contribute significantly to the quality of human life. In addition to providing to a host of social benefits, the universal access to basic services should also stimulate local economic development. Although significant progress has been made since 1994 with the provision of basic services, significant challenges remain (Statistics South Africa, 2016).

Figure 1 below indicates the number of consumer units receiving free basic services between 2007 and 2018. For the period ending June 2018, 4 089 034 consumer units received free basic water, 2 317 144 units received electricity, 2 989 014 units received sewerage and sanitation and 2 608 909 consumer units received services related to solid waste. These numbers represent a general decrease in the provision of free basic services between 2017 and 2018, indicating an area of concern.

Figure 1: Number of consumer unit: Free basic services



Source: Statistics South Africa (Non-financial census of municipalities: June 2018)

The functions of municipalities are set out in Section 156 of the Constitution. The municipal demarcation board has divided municipal functions into three categories according to its assessment of the relative priority (National Treasury, 2011). Priority 1 functions include basic services such as water, electricity reticulation, sanitation and refuse removal, as shown in Table 1.

Table 1: Priority functions of local government

Priority One Functions	Priority Two Functions	Priority Three Functions
• Water (potable) • Electricity reticulation • Sanitation • Refuse removal • Cemeteries • Fire fighting • Municipal health services • Municipal planning • Municipal roads • Storm water • Traffic and parking • Building regulations • Municipal public transport	• Air pollution • Beaches and amusement facilities • Cleaning • Control of public nuisance • Fencing and fences • Sell food to the public • Noise pollution • Pontoons and ferries • Pounds • Street lighting • Street trading • Trading regulations	• Municipal parks and recreation • Local sport facilities • Public places • Local tourism • Local amenities • Municipal airport • Licensing of dogs • Child care facilities • Sell liquor to the public • Markets • Burial of animals • Municipal abattoirs

Source: National Treasury (Local Government Budgets and Expenditure Review: 2011)

According to Mbonigaba & Oumar (2014), the organisation of municipal services is inefficient, either in terms of the distribution of resources or in the actual delivery of services to the community. The capacity of municipalities has consistently been questioned and has been found to inadequate to perform their functions (Manyaka & Sebola, 2015). Mutahaba (2006) indicates that the way municipalities organise themselves to undertake their functions has to change in response to the changing needs and demands of society. Municipalities need to focus on priorities within an increasingly complex and diverse set of demands, this will entail directing resources and institutional system to a new set of objectives that contribute towards the effective, efficient and economical use of resources (Manyaka & Sebola, 2015).

Roux & Nyamukachi (2005) argue that despite clear constitutional requirements and municipal legislation, municipalities in a majority of cases appear to be unable to render basic services such as housing, education, healthcare, sanitation, electricity, and water, especially in the poor and disadvantaged communities. This raises various concern amongst local communities about government's ability to implement well-meaning polices. The inability to render basic services at the required and expected levels impede on the principles related to the efficient, economical and effective use of resources. This inability relates to the actual functioning of municipalities, specifically questioning the capacity of councillors to monitor projects including finances and the inability to define the needs of the people they serve.

The reality is that many local municipalities are struggling to affect their development mandate (Madzivhandila & Asha, 2012). Mello (2018) supports this argument by indicating that municipalities are not performing at the level required and expected by law and citizens foot

the bill for the maladministration of municipalities. Madzivhandila & Asha (2012) relates this inability to render basic services due to three factors i.e. firstly, the absence of meaningful participation by stakeholders, resulting in a mismatch between actual services delivery and community needs. Secondly, the lack of interdepartmental co-operation and integration has contributed to crippling service delivery. Thirdly, drawbacks in financial management have undermined effective implantation. The insufficiency of financial resources are seldom enough reason for municipalities to be able to fulfil their constitutional and legal mandates in South Africa, as it is the responsibility of municipalities to use their limited resources optimally.

2.4 EVALUATION OF MUNICIPALITIES

Levin (2005) defines principles as unchanging non-negotiable values underlying a system. Principles are fundamental law forming the basis of reasoning or action (Gildenhuys & Knipe, 2007). A comprehensive definition is indicated by Fox & Meyer (1995) that the concept of principles relates to the existence of formal procedures prescribing a course of action to be taken in specific situations, which must be followed without personal benefit. In defining the principles to evaluate municipalities, these principles should focus on non-negotiable values, fundamental laws, and formal procedures. Ntonzima (2011) expresses that South Africa has reached a stage that requires tough interventions as rules, regulations, acts, principles, and policies (including legislative and policy frameworks) have been consistently violated. With a specific focus on public finances, if the prevailing state of affairs of municipalities cannot improve then governance may soon slide into a criminal state of governance. Municipalities have failed to apply principles related to public financial control and application practices (Ntonzima, 2011).

Erasmus (2008) argues that the formulated principles are in accordance with service delivery. Poor service delivery is thus a direct consequence of poor financial management. Organisational structures are created to satisfy the basic needs of the citizens of a country through public services. This is because citizens fund the governmental departments and corresponding services. Government departments thus need to be accountable to their financiers concerning service achievements. The service delivery principles related to ‘economy’ addresses imbalances created by the past with specific reference to the price for a

given quantity and quality of the provided service. Efficiency is defined as the ratio of resources utilised to produce the desired outputs with minimum energy time, money and other inputs. Financial performance efficiency can be measured by determining whether the same service may be rendered at a cheaper cost. The identification of fruitless expenditures, poor costing techniques or an inadequate reporting framework may be used as indicators of efficiency (Erasmus, 2008). According to Jones & Bates (1990) effectiveness entails the provision of a service that satisfies a real need.

The development of evaluation principles, corresponding targets and organisational objectives require measurement under the title of performance measurement. Linna, Pekkola, Ukka, & Melkas (2010) indicates that the public sector should devote more attention, time and money to performance management, measurement, and evaluation. However, such adaptation of private sector approached has caused several difficulties due to conflicting needs, undefined goals, lack of ownership and poor management skills. Contributing to the evolution processes of municipalities, public sector productivity forms a base for determining municipality evaluation principles. Public sector productivity is as important to the economic performance of a country as that of the private sector. First, because the public sector is a major employer, secondly, because the public sector is a major provider of business and social services and lastly, because the public sector is a consumer of tax resources (Linna et al., 2010).

Erasmus (2008) presents evidence that expenditure control forms the primary indicator of public sector financial performance. However, expenditure control does not ensure the quality or value of services received by the citizen. This resulted in a shift to focus on effective service delivery. In ensuring value for money service delivery the principle related to economy, efficiency and effectiveness is vital. The role of municipalities have evolved since 1995 and as such, related principles have evolved. According to Atkinson (2002), the expanded roles of local government saw advancing through at least three phases of development referred to as generation issues.

First-generation issues primarily related to political concerns and questions that occurred between 1995 – 1998 in South Africa. These concerns regarded the amalgamation of racially defined municipalities. The Local Government Transition Act relevant during this period effectively led to municipalities having their functioning authority. This phase was transitional which resulted in local governments developing very different styles of functioning. The

autonomous functional authority of municipalities gave rise to numerous challenges including service delivery problems (Atkinson, 2002).

Second generation issues effectively occurred between 1998 - 2001 and gave rise to the Local Government White Paper process. Effectively local governments implemented a consultative approach and were provided with normative and regulatory frameworks governing municipal functions. The second-generation phase focused on the overall vision and rationale of local government. The consultative approach facilitated discussions that attempted to flesh out the meaning of the constitutional provision on local government. This phase resulted in the drafting of the Municipal Structures Act and the Municipal System Act (Atkinson, 2002).

Third-generation issues have prevailed since January 2001 focusing on desirable outputs of municipal activity as well, as how these activities should be conducted i.e. municipal developmental policies and programmes. Third generation issues are concerned with a developmental style of functioning focusing on a more structured approach to how local governments conducted their activities. These activities relate to complying with reporting and accountability requirements, organisation design and demarcation issues, financial flow, human resources, stakeholder consultation, and coordination and adherence to government objectives concerning service delivery (Atkinson, 2002).

Based on the evolution processes of municipalities, principles should align with third-generation issues. These issues relate to addressing the huge service delivery backlogs, poor financial management, addressing services delivery protests, weak civil society formations, corruption, poor communication, accountability and insufficient municipal capacity owing to lack of scare skills (Ntonzima, 2011). Principles related to huge service delivery backlogs should be result and outcome-driven in determining the success rate of government interventions in the provision of basic services. The community survey 2016 estimated that 1,7 million households in the country did not have access to piped water in 2016. Highest backlogs were recorded in Eastern Cape, Limpopo, KwaZulu-Natal, and the North West provinces. Table 2 below indicates household backlogs in accessing piped water by province.

Table 2: Household backlog in accessing piped water

Province	Access to piped water	No access to piped water	% Backlog	Total
Western Cape	1 914 055	19 822	1.0%	**1 933 877**
Gauteng	4 826 194	124 943	2.5%	**4 951 137**
Free State	910 582	36 056	3.8%	**946 638**
Northern Cape	333 408	20 301	5.7%	**353 709**
Mpumalanga	1 090 892	147 969	11.9%	**1 238 861**
North West	1 074 968	173 799	13.9%	**1 248 767**
Kwa-Zulu Natal	2 457 350	418 493	14.6%	**2 875 843**
Limpopo	1 280 077	321 006	20.0%	**1 601 083**
Eastern Cape	1 331 228	442 167	24.9%	**1 773 395**
South Africa	**15 218 754**	**1 704 556**	**10.1%**	**16 923 310**

Source: Statistics South Africa (Community Survey 2016)

Huge service delivery backlogs is not only isolated to water, as backlogs are experienced in sanitation, solid waste and electricity services as indicated in Table 3. The total number of households estimated in the community survey 2016 is 16 million households. From this total 36.6% of households do not have full access to sanitation services, 60.6% of households do not have full access to solid waste services and 11.4% of household do not have full access to electricity services. This implies that most households have either no service, minimal service, basic service or intermediate service related sanitation, solid waste and electricity. The highest backlogs for sanitation and solid waste services were recorded in Eastern Cape, while the highest backlog for electricity services was recorded in Gauteng.

Table 3: Household backlog in sanitation, solid waste and electricity services

Province	Percentage Backlog		
	Sanitation Services	Solid Waste Services	Electricity Services
Western Cape	6.6%	13.2%	7.3%
Gauteng	53.2%	58.7%	15.7%
Free State	30.8%	38.2%	12.8%
Northern Cape	27.8%	30.3%	8.1%
Mpumalanga	53.2%	52.3%	14.4%
North West	52.3%	45.2%	12.8%
Kwa-Zulu Natal	13.7%	16.4%	14.4%
Limpopo	54.3%	60.6%	11.4%
Eastern Cape	76.4%	78.1%	8.6%
South Africa	**36.6%**	**39.0%**	**12.4%**

Source: Statistics South Africa (Community Survey 2016)

The extent of poor financial management can be determined by financial audits conducted on municipalities and corresponding outcomes. A summary of audit opinions for municipalities is shown in Table 4 from 2011/12 to 2015/16. The number of unqualified or clean reports gradually increased between 2011 and 2016, to a maximum proportion of 62% of total municipalities indicating clean reports. The remaining municipalities had various concerns raised regarding their financial health. According to the Auditor General (2018) annual report for the 2016/2016 audit cycle, the audit outcomes showed little improvement and municipalities regressed.

Table 4: Audit opinions for municipalities, 2011-2016

	2011/12		2012/13		2013/14		2014/15		2015/16	
Opinion	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**
Adverse	4	1%	9	3%	3	1%	4	1%	4	1%
Disclaimer	90	32%	66	24%	55	20%	33	12%	25	9%
Qualified	68	24%	83	30%	71	26%	76	27%	63	23%
Unqualified	116	42%	120	43%	149	54%	165	59%	171	62%
Audits Outstanding	0	0%	0	0%	0	0%	0	0%	15	5%
Total	**278**	**100%**	**278**	**100%**	**278**	**100%**	**278**	**100%**	**278**	**100%**

Source: National Treasury (The state of local government finances and financial management)

Regarding the third generation issue, services delivery protests, Morudu (2017) explored the underlying relationship between the level of services delivered by local municipalities and the

number of protests in the country. Using quantitative exploratory methods, results indicate that protests tend to increase with declining provisions of basic services like housing, electricity, sewerage, and sanitation, refuse removal, school, and hospitals in highly populated areas. Recommendations include the need for local municipalities to accelerate the provision of basic services to minimise the occurrence of protest (Morudu, 2017).

2.5 ASSET MANAGEMENT IN MUNICIPALITIES

Winn (1997) eludes to the fact that asset efficiency can be achieved if the net earnings of a company increase in proportion to an increase in assets. This can be measured by comparing a firm's income to the book value of its total assets, thereby reflecting how well its assets are used to generate income. A low asset turnover ratio may indicate poor profit margins or increase in capital intensity due to expansion without corresponding return (Winn, 1997). Representing the primary objectives of municipalities, Houten & Zhang (2010) indicate that assets are essential to any organisation, hence their management plays an important role in determining organisational success. Houten & Zhang (2010) define asset management as a systematic process of coordinated activities aimed at delivering a certain level of services cost-effectively. These activities include activities such as planning, scheduling, maintaining and controlling assets. The importance of a systematic approach, contained in the definition, is to facilitate traceable decision making concerning changes in public expectation.

Shah et al., (2017) analysed various definitions related to asset management and identified that these definitions are consistent with an approach that is systematative, strategic and customer-focused. These themes are of particular relevance to infrastructure assets that justifies the large budget allocation to ensure the provision of basic services to communities. In general, asset management decisions are based on three criteria i.e performance, expenditure and risk associated with the asset or system of assets. Performance measures provide fundamental information related to decision making by translating management priorities into specific actions. Management decisions based on expenditure related criteria focus on conducting a cost-benefit analysis on expenditure related to operations, maintenance, renewal, new work and disposal of infrastructure assets. Lastly, the risk associated with the asset and corresponding risk exposure should be managed to acceptable levels (Houten & Zhang, 2010).

Asset management is an emerging discipline which has been acknowledged by Hanis, Trigunarsyah, & Susilawati (2011) as a crucial tool in establishing more efficient and effective organisations. A key component related to the asset management definition is the focus on customer service delivery, thus implying a significant relationship between efficiency and effective of assets management and service delivery. Most of the 257 municipalities are in a disastrous financial position which has serious consequences in that municipalities are unable to deliver services such as clean water, sanitation, and electricity (Brand, 2018). Hanis et al., (2011) indicate that there is a wide gap between demand for public services and the availability of assets as supporting tools for successful service delivery. The gap between demand for public service and actual performance by municipalities is supported by the wave of unrest that has escalated to the extent that the democratic stability of the country could be jeopardy (Roux & Nyamukachi, 2005).

The inability of municipalities to render basic services such as housing, electricity and water is demostrated by thousands of people protesting their dissatisfaction with municipalities public. This dissatisfaction demonstrates that municipalities have failed to administer, plan and budget according to priority related to basic needs of the community and to promote the social and economic development of communities, implying that municipalities have failed to administer efficient asset management and related principles. Tsheola (2012) indicates that violent protests should suggest that the service delivery decisions are not reflective of the public needs, aspirations, uncertainties, and fears. Service delivery challenges are a result of little investment in new infrastructure and a failure to maintain existing infrastructure. This failure by municipalities is supported by Mpehle (2012) indicating that service delivery in several local municipalities is perceived to be proceeding at a snail's pace, minimal and not adequately visible to the majority of people.

2.6 EFFICIENCY MEASUREMENT OF BASIC SERVICE DELIVERY

The quest for efficiency in the provision of basic services is highlighted by challenges facing municipalities, specifically related to the efficient utilisation of infrastructure assets. This serves as an indicator of municipal efficiency, focusing on the ability of municipalities to optimally utilise infrastructure assets and generate revenue. This pressure for efficiency in the

provision of basic services is one of the greatest expectations of a sound municipal financial management process (Monkam 2014).

This efficiency expectation is further accentuated in a resource-constrained environment. The effective and efficient utilisation of assets is critical in ensuring that key organisation objectives and goals can be achieved. As a result, for many industries, asset efficiency is a principal focus of management and related strategy, especially asset utilisation in industries that have intensive capital asset requirements. Despite the requirement for capital asset efficiency, municipal managers tend to focus less on the management of capital assets than their counterparts in industry (Zismer, Sterns, & Claus, 2011).

The need for operational efficiency and financial sustainability practices are not isolated to local government institutions, these practices are essential for enterprises operating within the environment of the private and public sector. Ghosh & Maji (2004) indicate that efficient management of capital is one of the pre-conditions for the success of an enterprise and entails managing the various components in such a way to ensure the smooth running of a firm and fulfilment of business objectives.

Efficiency measurement of basic service delivery within South African municipalities has been limited. Against this limited research, a good deal of concern has been expressed over various aspects related to local government including its operational efficiency (Westhuizen & Dollery, 2009).Westhuizen & Dollery (2009) conducted a study in 2009 and indicates that at the time of the study there has been no work econometrically evaluating the efficiency of local government service delivery. The study conducted by Westhuizen & Dollery (2009) focused on economic efficiency specifically related to technical or productive efficiency, which refers to the use of resources in the most efficient manner to obtain the maximum possible output from a given set of inputs. The study utilised data environment analysis (DEA) to measure the relative efficiency of organisations operating in the same industry such as municipalities. DEA combines all the inputs and output information into a single measure of productive efficiency that lies between zero (indicating completely inefficient) and unity (indicate completely efficient).

In the study, DEA was performed using output variables associated with the total number of households receiving Reconstruction and Development Programme (RDP) water, sanitation, electricity and refuse removal. For the input variable, operational income was used as the input

variable as this represents the funds utilised to deliver the various services. The efficiency estimates were executed under constant returns to scale and variable returns to scale, embracing both output-orientation and input-orientated approaches. The input-orientated approach applied to a municipality seeks to deliver the desired output with the minimum input while the output-orientated approach seeks to maximise the output with a given set of inputs.

The result of the study indicated that most district municipalites are not operating at an optimal scale. Combining both approaches i.e output-orientated and input-orientated, nine district municipalities were fully technical efficient, using their inputs optimally. The remaining municipalities can either reduce their input without a corresponding reduction in output or expand their output without a corresponding increase in their input. The results indicated that municipalities operating within the Eastern Cape were the worst-performing municipalities both in terms of output-orientated and input-orientated approaches.

In a study by Monkam (2014), conducted five years after Westhuizen & Dollery (2009), indicates that the problem and challenges facing municipalities are so crucial that questions concerning their capabilities to efficiently deliver on expected outcomes have been debated. The study focuses on productive efficiency or technical efficiency by investigating the maximum provided local public services at the lowest possible cost, similar to the study conducted by Westhuizen & Dollery (2009). The investigation focused on estimating the level of technical efficiency for all municipalities using the DEA, followed by a second stage analysis to explain efficiency scores. The returns to scale input-orientated DEA variables scores indicated that approximately 7.6% of local municipalities were efficient relative to others, with an efficiency score equal to one. On average all municipalities could have achieved the same level of basic services with about 83% fewer inputs, suggesting municipalities are inefficiently is utilising resources. The study also found that the difference between the most efficient and least efficient municipality are substantial (Monkam, 2014).

The literature on technical efficiency and corresponding determinants in the provision of local public services has also been debated (Monkam, 2014). The municipal output-indicator representes the number of consumer units to which basic services are delivered and the number of units receiving a bill for these services, while the input indicator was represented by total municipal operating or current expenditure. The strength of this study was that the output indicator as determined by the supply side i.e according to the municipalities records, produced

similar results when utilising the output indicator as determined by the demand side i.e demand by households for local service delivery (Monkam, 2014).

Mahabir (2014) conducts a study quantifying the inefficient expenditure in local government. This highlights the fact that municipalities should spend effectively and efficiently to maximise and sustain high-quality services in their communities. In spite of this principle, municipalities continue to perform poorly in the delivery of basic services resulting in frequent service delivery protest. Mahabir (2014) assessed the efficiency by which municipalities spend their resources in the provision of basic services to communities and quantifies the number of resources spent inefficiently. The study primarily focused on determining efficiency scores based on input-oriented efficiency methods. This was due to the behavioral nature of government entities in that municipalities tend to have more control over their inputs as opposed to their outputs. The analysis utilised municipal operating expenditure as the input-variable while the output-variable was defined as the number of consumer units that have access to basic services. In computing the efficiency scores for a sample of 129 municipalities, the study utilises frontier production / efficiency analysis. This facilitated the ranking of municipalities relative to the most efficient municipalities on the production possibility frontier (PPF).

The results of the study indicated that over the five years ten municipalities maintained constant efficiency, representing 8% of the sampled units. A total of 100 municipalities or 78% of the sample were not efficient in any of the financial years reviewed. On average the study indicated that municipalties can obtain the same level of output with at least 54-58% less inputs. In other words, municipalities wasted 58% of resources in 2005/2006 and 2009/2010, 54% of resources in 2006/2007 and 2007/2008 and 55% of resources in 2008/2009. Converting the results of efficiency scores into nominal prices reflect the significance in term of actual rand values. In 2005/2006 the sample municipalities inefficiently spent R43 billion. The amount of funds inefficiently spent increased to R45 billion in 2006/2007, R52 billion in 2007/2008, R65 billion in 2008/2009 and R80 billion in 2009/2010. In total, R286 billion was wasted by sampled municipalities over the five years, indicating a disturbing misuse of taxpayer's monies. The value of the study conducted by Mahabir (2014) is that the technique utilised differs to previous studies. Additionally, the ranking of municipalities will assist policymakers in improving and ensuring scarce resources are utilised optimally (Mahabir, 2014).

In a further study using DEA, Mbonigaba & Oumar (2014) conducts an investigation to compare the relative efficiency of municipalities across primary health care and hospital health care services. Using the input-oriented model, the input indicator variable used reflected the proportions of medical expenditures and management expenditures on each type of health care to reflect the use of administration and medical resources. The output indicator variable was guided by their representation of typical output in each type of health care. The results indicate that very few municipalities emerge as the best practicing municipality from which other municipalites can learn, suggesting that municipalities are generally underperforming. This was supported by the fact that most municipalities changed their technical efficiency ranking across each type of care i.e between primary health care and hospital health care. Mbonigaba & Oumar (2014) further indicates that inefficiency among public institutions providing health care is not unique to South Africa.

2.7 FINANCIAL HEALTH OF MUNICIPALITIES

The state of local government finance and financial management report (National Treasury, 2017) contains eight key measures in identifying the financial health of municipalities. From these eight key measures, the four key measures that are most relevant to this study and the efficiency of municipalities are, the persistence of negative cash balances, maintaining operating expenditure by utilising cash, financial management recording and reporting and infrastructure asset management. The following criteria four will be discussed that are of relevance to the efficiency of municipalities.

Measurement criteria one, the persistence of negative cash balances is a very strong indicator whether the municipality is in financial distress. In term of Section 45 of the MFMA (Republic of South Africa, 2004), municipalities are not permitted to close the financial year with any short-term borrowing or overdraft. According to the local government finances and financial management report (National Treasury, 2017), many municipalities experienced cash-flow problems. These cash-flow problems that persist over several of months is a strong indicator that there are severe underlying financial problems that impact on the efficiency and effectiveness of municipalities. The number of municipalities indicating negative cash balances

for a period more than one month of the previous 6 months amounted 64 for the 2016/2017 financial year.

Measurement criteria two, maintaining operating expenditure by utilising cash is critical in ensuring monthly financial commitments are met. The level of cash coverage is especially important when its revenue collection is threatened, a prudent level of cash coverage is between one and three months. The number of municipalities that had less than the required cash coverage as at the end of June 2017, amounted to 136 municipalities. This indicates that municipalities continue to struggle to understand the critical concept that budget for surpluses is necessary to avoid cash and liquidity problems. A reason cited for poor cash coverage relates to a major breakdown in service delivery assets resulting in non-supply, especially of water and electricity and therefore a loss of revenue.

Measurement criteria three, the local government finance and financial management report indicates that municipalities are still not properly forecasting expenditure patterns and that there is a serious problem of not spending according to expenditure plans. During the 2016/2017 year-end, under-spending of municipalities according to their capital budget amounted to R14 439 billion. Indicating municipalities struggle with implementing their capital budget, a contributing factor is poor asset management.An important observation, made by Mahabir (2014), is the variation between planned and actual expenditure patterns within municipalities. The differences between these expenditure patterns provide a glimpse into the inherent expenditure inefficiencies across municipalities in the country. The concern that most municipalities cannot spend their budgets already indicates a degree of spending inefficiencies and possible poor service delivery (Mahabir, 2014).

Measurement criteria four, asset management must be considered as a key spending priority for municipalities since infrastructure assets are essential to sustainable and continuous service delivery. During the 2015/2016 financial year-end electricity and water, losses amounted to a total of R 9.5 billion. This significant loss in water and electricity is attributed to aging infrastructure, low expenditure on capital asset renewal and insufficient repairs and maintenance of infrastructure. Municipalities allocate insufficient funds for asset repair and maintenance that compromises the credibility and sustainability of basic services. According to the local government finances and fiancial management report (National Treasury, 2017), the national aggregate spending on repairs and maintenance as a percentage of property, plant and equipment (PPE) averages around 3.4%, the national norm according to National

Treasury's financial indicators is 8 %. Overall, municipalities are not sufficiently prioritising expenditure on asset management and as a result, these spending areas receive a limited allocation.

2.8 EFFICIENCY INDICATOR UTILISING INFRASTRUCTURE ASSETS

The need for the efficient management of infrastructure assets stems from the fact that tangible non-current or fixed assets form an important part of the financial structure of any firm, organisation, institution or entity. Since many tangible non-current assets are expensive, they require higher-levels of management. Investigations related to the assessment by which South Africa municipalities spend their resources in the provision of basic services generally focused on operating expenditure and spending inefficiencies. In the study conducted by Mahabir (2014), the general composition of operating expenditure, isolated to variables contributing more than 5% of total expenditure included employee costs, material and bulk costs, depreciation and amortisation, repairs and maintenance and (the largest contributor) other expenditures. Mahabir (2014) argues that the reason for concentrating on operating expenditure is based on the fact that this type of expenditure results in the immediate delivery of a service or output for public consumption. While the reason for not focusing on capital expenditure is that this form of expense concerns longer-term infrastructure projects that are not linked to the immediate provision of services.

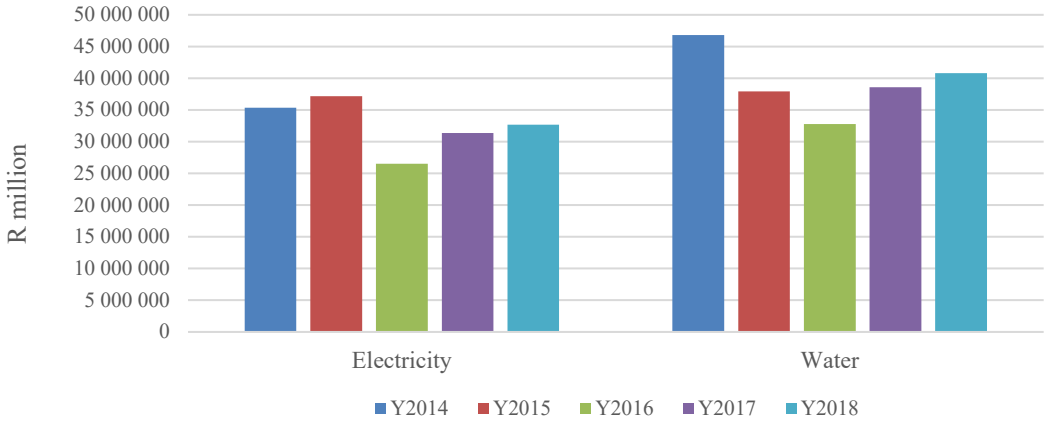
Linking to the immediate provision of a service is the actual infrastructure asset, indicated as carrying value in a municpality's financial records. Without these assets the provision of basic services will not be possible. The value generated by infrastructure assets is related to the ability of the asset to deliver the intended functionality at the required performance while satisfying various stakeholder needs (Srinivasan & Parlikad, 2017). The value of infrastructure assets is further indicated by an investigation conducted by Amador-Jimenez & Willis (2012). The study determines the existence of a relationship between the level of infrastructure development and a country's corresponding economic and social development. The correlation investigation between infrastructure and national development indicate that accumulated investment (long-term commitment to infrastructure) leads to an increase in Gross Domestic Product (GDP).

This indicates that economic growth is due to improvements in infrastructure, and movement is constant between both variables.

Hanlon (2014) indicates that there are three laws of manufacturing sector asset management that applies to asset management within the public sector. The law most applicable to this study indicates that asset management is about delivering business value. Potential or actual business values are derived from assets under the control or ownership of the organisation. Asset management is a coordinated set of activities designed to deliver that business value in line with organisational objectives and appetite for risk.

The demand for efficient management of infrastructure assets can be substantiated by the actual value of these assets. In the most recent results published in the financial census of municipality (FCM) survey, the carrying value of infrastructure assets was estimated at R465 billion as at June 2018, electricity infrastructure comprised of R32.7 billion, while water infrastructure amounted to R40.8 billion (Statistics South Africa, 2019). Figure 2 below illustrates the carrying value of infrastructure assets related to water and electricity between 2014 and 2018.

Figure 2: Carrying value of water and electricity infrastructure assets



Source: Statistics South Africa (Financial census of municipalities)

These infrastructure assets are required to generate value by their ability to deliver the intended functionality while satisfying the needs of the various stakeholder. The non-financial census survey of municipalities indicates the number of consumer units provided with service from these infrastructure assets. The results of this survey indicate that for water 13 289 089 consumers were provided with services, while 11 916 039 consumer units were provided with electricity service for 2018. The provision of these services does not equal the demand for these

services, as demand outstrips supply. The number of consumer units utilising water services, on average for the past five, has increased by 2.1% p.a., while electricity on average has increased by 3.4% p.a. (Statistics South Africa, 2018). Focusing on efficiency, the proportion of consumer units utilising water and electricity infrastructure has not increased significantly, indicating no substantial improvement in the way infrastructure assets are utilised.

Adding to the concerns related to asset utilisation and efficiency of asset management is the rate of additions to new infrastructure and repair and maintenance related to existing infrastructure. Additions related to new electricity infrastructure indicated an average decrease of 1 % between 2015 and 2018, while water infrastructure indicated an average increase of 2%, first decreasing for two consecutive years and then increasing substantially in 2018. Repair and maintenance indicated an average decrease of 11% between 2015 and 2018 (Statistics South Africa, 2019). The ability of municipalities to generate income utilising water and electricity infrastructure, on average since 2015 has shown a decrease of 10.6% for water while electricity reflected an average decrease of 4.9% (Statistics South Africa, 2019). These decreases reflect inefficiencies in the ability of municipalities to utilise infrastructure assets to generate increasing returns. A slight failure of any element within or the system as a whole can lead to devastating losses and operational problems to an entity and the society as a whole (Japhet & Nelson, 2011).

2.9 CONCLUSION

Sound financial management principles derived from the regulatory frameworks concerning key asset management principles indicate that efficient, economical and effective use of resources must respond to the needs of people and these service delivery needs should guide asset practices and decisions. Other asset management principles indicated that asset planning and management should be integrated with business plans, asset management decisions should be based on evaluations of alternatives that take into consideration life cycle costs and finally, ownership, control and accountability including reporting requirements should be established (Daya, 2004).

The inability to render basic services at the required and expected levels related to economic, efficient and effective use of resources is demonstrated by the continued service delivery protest action. This is further supported by household backlogs in accessing basic services, the poor financial management of municipalities, cash-flow problems, production losses due to aging infrastructure, lack of repair and maintenance, the average decrease in additions to new assets and inadequate growth in consumer units.

Efficiency measurement of basic services delivery using an input-orientated and output orientated approach indicate concerns over local government ability in delivering basic services to communities. Research conducted within this field of efficiency measurement, support the conclusions that were drawn by each study and maintains consistency over time. Against this limited research, studies recommend further evaluation of municipalities to be conducted.

CHAPTER 3: METHODOLOGY

This chapter represents a description of the analysis to be conducted concerning the study of financial efficiency within the public sector specifically related to municipal infrastructure assets. The focus areas include the choice of the study area, chosen variables and data collection, and finally, how data processing and analysis will be conducted. This study is empirical by its very nature and therefore follows a positivistic methodological approach for conducting research. The facts presented herein are derived from municipal financial information and focuses on quantitative analysis in the development of the theory that can form a basis for further research to be conducted.

3.1 CHOICE OF THE STUDY DESIGN

Around the world, as infrastructure spending increases and government budgets and credit remain tight, the attention is turning to capital efficiency. An important part of this is assessing the return on infrastructure assets (The Economist Intelligence Unit, 2014). Regardless of the source of funding, companies and governments need to ensure that the design, construction and maintenance of infrastructure assets makes the most efficient use of limited resources (The Economist Intelligence Unit, 2014). The Economist Intelligence Unit defines capital efficiency as the ratio of its output, in terms of revenue-generating assets, to the capital expenditure needed to operate the intended infrastructure asset.

Information related to infrastructure reporting remains one of the most neglected topics in the literature (Jones, Hensher, Rose, & Walker, 2012). This study aims to contribute to the financial reporting and assessment of infrastructure efficiency. Improved information and reporting can have several benefits to decision-makers including better information for assessing the physical condition of assets, current and future funding requirements and for the development of strategies related to the maintaining or renewal of infrastructure (Jones et al., 2012). The ultimate use of the information will be to improve decision-making, improve the usage of limited resources and promote a higher standard of living.

Westhuizen & Dollery (2009), indicate that the efficiency measurement of basic service delivery within South African municipalities has been limited. As a result of this limitation, this study requires a data-driven approach in an attempt to obtain valid conclusions related to the gap that exists between efficiency principles and current asset management practices. The primary focus in this study is on infrastructure assets and determining the extent to which these assets are utilised efficiently by South African municipalities. This will be conducted by measuring a municipality's ability to use its non-current assets, specifically the carrying value of water and electricity infrastructure to generate water and electricity sales. Pinprayong & Siengtai (2012) suggest that the return on assets is a suitable measure of overall company performance, as it indicates the relationship between assets and revenue-generating ability.

Too (2011) highlights the need for asset managers to consider the gap between performance and capacity of existing assets and the requirements for delivering the minimum services needed by the business in the area of growth. Too (2011) eludes to the fact that the demands on infrastructure should not outstrip the capabilities of supplying the required service, managers should seek the best ways to utilise assets in the delivery of services to customers.

The various components of this study related to the gap that exists between the desired state and the current state of infrastructure asset management, include:

(1) Identify the unit of analysis as the major entity that is being analysed,
(2) determining the measurement methods,
(3) determining the data sources,
(4) determining the relevant variables for analysis,
(5) applying the measurement methods to relevant variables,
(6) conducting the analysis,
(7) formulating the conclusion and the presentation of results.

The six research questions identified include:

- What is the association between key variables related to the carrying value of water and electricity infrastructure and generated sales?
- What is the average percentage change in total sales of water and electricity between 2015 and 2018?

- How has the average total carrying value of water and electricity infrastructure changed been 2015 and 2018?
- How efficient have municipalities been performing between 2016 and 2017 as reflected by the return on asset ratio?
- Which are the most efficient and least efficient municipalities?
- What is the efficiency gap between municipalities and selected private sector industries?

The following objectives have been identified to achieve the aims of the research and answer the above-mentioned research questions:

- Understanding the theory related to the study by conducting a comprehensive literature review regarding legislative frameworks governing municipal responsibilities and functions, determining asset management within municipalities, identifying efficiency levels, measurement criteria, and research gaps and finally determining the financial health of municipalities.
- Identifying key efficiency variables and focusing on inter-relationships between variables related to the calculation of return on asset ratios by utilising correlation and regression models.
- To determine the efficiency gaps between the most efficient and least efficient municipalities and efficiency comparison with selected private sector industries concerning asset utilisation.
- Make recommendations from the analysis to assist policymakers and municipalities in their efforts to improve assets utilisation and efficiency. The study aims to contribute to the asset management knowledge base and to provide data-driven, evidence-based research that will assist municipalities to increase infrastructure efficiency.

Igwenagu (2017) indicates that the unit of analysis is the major entity that is being analysed in a study. It is the ‘what’ or ‘who’ that is being investigated, these are essential units that are examined to create descriptions and explain differences. The unit of analysis relates to determining the efficiency in which municipalities utilised their infrastructure assets in providing basic services to communities. This unit of analysis or the ‘who’ of the study being

investigated is the independent factor creating the current situation, which is South African municipalities. The unit of analysis represented by municipalities will be subjected to a financial analysis focusing on input and output variables that are critical in the provision of water and electricity basic services. This financial analysis will provide insight into asset management practices within municipalities and the degree to which these assets are being utilised.

3.2 DATA COLLECTION AND VARIABLES

Secondary data will be sourced from Statistics South Africa, specifically the financial census of municipalities and the annual financial statistics (AFS) surveys. The financial information contained in these surveys represent data collected from a questionnaire-based survey, where possible audited annual financial reports from private and public enterprises and municipalities are used in generating survey results. The financial census of municipalities contains information related to the financial position and financial performance of municipalities. Specific variables contained in this survey include total assets and total liabilities including the various sub-components, a detailed breakdown of property, plant and equipment and income and expenditure items. Information is available by type of service provided by the municipalties i.e rates and general services and housing and trading services. The annual financial statistics surveys contains similar information but the survey participants include private and public enterprises.

The approach undertaken in this study is to determine the operational efficiency of municipalities in utilising water and electricity infrastructure to generation-associated water and electricity sales. In assessing the efficiency of municipalities a functional relationship between inputs and outputs needs to be predefined that will facilitate further data analysis. The analysis to be conducted in this study is of a financial nature focusing on financial ratios as a primary measurement tool, the specific ratio to be used is the return on asset ratio. This ratio will facilitate the interpretation, amplification, and translation of financial data into information related to business operations, financial position, and future prospects. The variables chosen needed to conform to the following criteria, firstly these variables need to represent key variables that directly relate to the objectives of municipalities in providing water and electricity

services. Secondly, the chosen variables needed to validate the return on asset ratio and finally the reliability of the chosen variables needed to be of acceptable quality limited to municialities reporting both key variables.

The total water and electricity carrying value of infrastructure and total related sales will be used to calculate the return on asset ratio. This will determine the efficiency of municipalities in utilising assets to generate sales. The calculated return on asset ratio will further facilitate the ranking of municipalities according to the most efficient municipalities, the least efficient municipalities and determining the efficiency gaps between municipalities and selected private sector industries.

The financial census of municipalities and the annual financial statistics surveys both exposed to limitations. These limitations include sampling and non-sampling errors, sampling errors relate to imprecision due to sampling variability while non-sampling errors refer to imperfections in reporting by providers, errors made in collection and errors made during data processing. The possibility of these errors occurring or the impact of these errors are reduced by ensuring sampling variability (standard errors) are maintained with the required standards and by ensuring efficient and effective operating procedures and systems are used to compile statistics. These limitations are further reduced by ensuring both surveys obtained the highest possible response rates, the latest financial census of municipalities survey obtained a response rate of 100% while the latest annual financial statistics surveys obtain a response rate above 80%.

The main limitations of these surveys are that both are questionnaire-based surveys and are subject to interpretation and imperfections in reporting by respondents. Additional, the differences in accounting policy and practices across municipalities, businesses and industries can also lead to some inconsistencies in the data used to compile the estimates. These limitations are reduced by ensuring input and output editing occurs by observation, by variable and by data confirmation or respondent data verification. The annual financial statistics survey is subjected to sampling variability and the survey does not publish information disaggregated by province or by municipal area, as a result during data analysis comparison between municipalities and selected private sector industries will be conducted on a national level. Comparisons at national levels will not jeopardise the results as the purpose of the comparison is to determine efficiency benchmarks and standards at aggregrated levels.

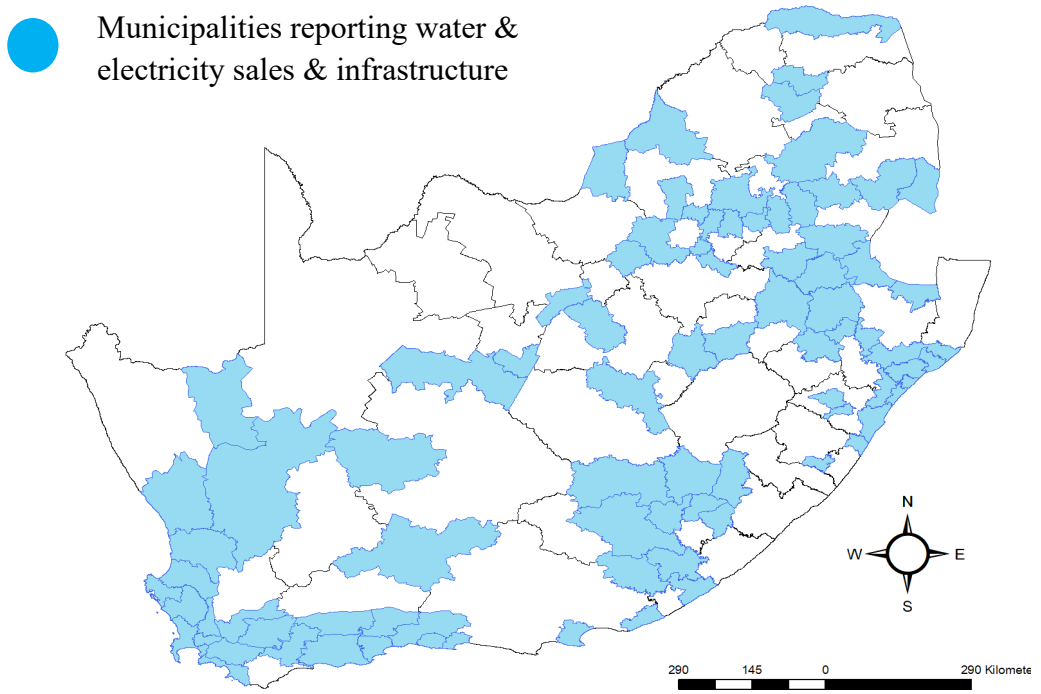
3.3 DATA PROCESSING AND ANALYSIS

After all the necessary data has been obtained and assembled accordingly, the first phase of this research will utilise correlation analysis specifically Pearson correlation coefficient to help discover and quantify the degree to which variables are dependent upon each other. Once a relationship has be established between variables, these variables will be subjected to simple linear regression analysis. The simple linear regression analysis allows the correlation to occur between the defined independent and dependent variables, which in turn will be useful in determining the true relationship between these variables.

By using this method, the researcher will be able to determine the significant of each explanatory variable to model and the overall model significance. This will also facilitate determining the true relationship between the dependent and independent variables and further explores the effect of the independent variable on the dependent variable.

The measurement method to be utilised will focus on these on input and output variables. Bartuseviciene & Sakalyte (2013) indicate that efficiency determines how successful inputs have been transformed into outputs. This measures the relationship between inputs and outputs taking into consideration eliminating reduced yield, process defects, reduced speed, minor stoppages, set-up or adjustment and equipment failure. The second phase will focus on determining municipalities that will be subjected to financial analysis. This is based on municipalities that have reported key variables that form the foundation of this study. Figure 3, below highlights in blue municipalities that record and recognise the carrying value of water and electricity infrastructure assets in their financial records based on the June 2017 financial year-end.

Figure 3: Municipalities reporting water and electricity carrying values and sales



Data source: Statistics South Africa (Financial census of municipalities, 2017)

Focusing on financial information, the value of an entities performance in terms of their efficiency relates to the optimal use of resources to achieve the desired output, thus indicating a relationship between input and output. The relationship between input and output variables pertain to the unit of analysis i.e. municipalities will be measured using the return on assets financial ratio. Calculation of these ratios represent the third phase of this research.

Financial ratio analysis represents a technique that is commonly used in analysing the financial statements of a company, this analysis facilitates the determining of circumstances related to the financial position or financial performance of a company, a group of companies or specifically related to an industry. An assessment of the financial performance describes the financial development of a company in terms of achievements and future operations (Heikal, Khaddafi, & Ummah, 2014). The fourth phase will entail conducting a comparison of the return on asset financial ratio between municipalities and selected private sector industries; this will facilitate determining the efficient gap.

Initially, data was exported from SAS to Excel for the conversion of raw values into percentages change, computation of totals and conducting of quality checks. The first step in

calculating the return on assets financial ratios was to categorise each variable according to the relationship that exists between variables, using a correlation matrix.

Next, the return on assets financial ratio for all municipalities, that have reported carrying value for water and electricity infrastructure assets, will be computed for a period between 2016 and 2018. The return on assets financial ratio forms the essence of this study; indicators will be computed and compared across municipalities responsible for water and electricity infrastructure assets. During analysis, the computed ratios will be ranked to determine the most efficient and least efficient municipalities.

Comparisons of financial ratios will be conducted to determine whether asset utilisation has improved, regressed or remained consistent. This longitudinal data analysis will be used to track responses of over a period, this will indicate changes more clearly and accurately. The analysis to be conducted in this study aims to track performance over a period and indicate changes in the financial state of municipalities. Further, the compilation and analysis of financial ratio will contribute to knowledge related asset management within municipalites.

Lastly, this study highlights the need for information related to infrastructure asset efficiency, in an attempt to bridge the gap between practices undertaken in the private sector environment compared to practices undertaken in the public sector environment. The survey data will be subjected to a comparative analysis between municipalities and between selected private sector enterprise, utilising the same financial variables applicable in the calculation of the return on assets financial ratio related to municipalities.

CHAPTER 4: ANALYSIS AND INTERPRETATION OF RESULTS

4.1 INTRODUCTION

The purpose of this chapter is to present and discuss the results from the financial census of municipalities (FCM) survey conducted by Statistics South Africa (Stats SA). Although, the survey containing numerous variables related to the financial position and financial performance of municipalities, this study will focus primarily on the utilisation of water and electricity infrastructure assets in the delivery of basic services. The analysis presented will focus on the optimal use of resources to achieve the desired output, thus indicating a relationship between input and output.

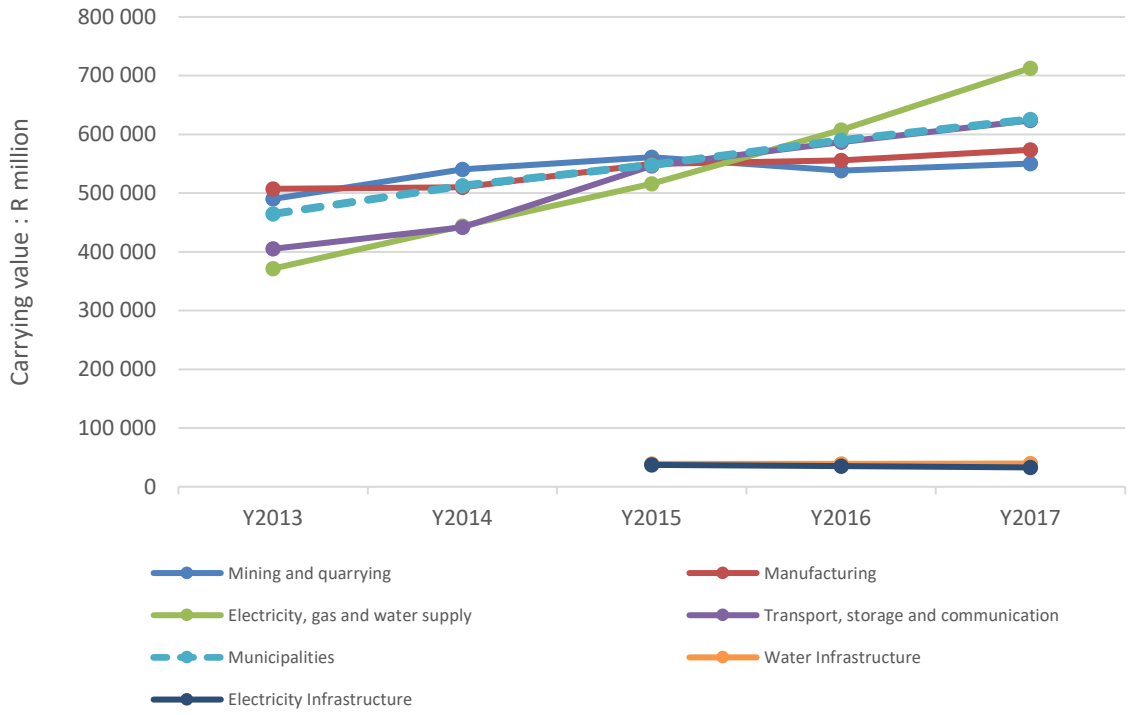
In determining the efficient utilisation of infrastructure assets by municipalities, the study will mainly present results between the period 2016 and 2018, in certain instances, data will be presented from 2013 while averages will be calculated from 2015. This chapter will conclude by conducting assets utilisation comparisons between municipalities and the private sector. Information related to private sector statistics will be sourced from the annual financial Statistics survey conducted by Statistics South Africa. This comparison will attempt to quantify the gap between practices undertaken in the private sector environment compared to practices undertaken in the public sector environment.

4.2 DEFINING KEY VARIABLES

Amongst the vast amount of financial information contained in the financial census of municipalities, a key component or key variable is the carrying value of property, plant, and equipment. Comprising mainly of land and building, infrastructure assets, community assets, heritage assets, and housing assets, this variable represents adjustments recognised within each asset category that are recorded in the annual financial statements of municipalities. These adjustments represent additions to assets, work-in-progress, revaluations, depreciation, impairment and disposals of assets.

The financial census of municipalities estimated the carrying value of property, plant, and equipment at a preliminary value of R652 billion as at June 2018, while the June 2017 figure was revised to R624 billion. The significance of this amount can be determined when conducting comparisons with other capital-intensive industries operating within the private sector environment, as published by the annual financial statistics survey. The only industry reflecting a larger carrying value of property, plant, and equipment when compared to municipalities is the electricity, gas and water supply industry, reflected in Figure 4. Information for the annual financial statistics survey is available up until the financial year ending June 2017.

Figure 4: Carrying value of property, plant and equipment (current prices): 2013-2017



Data source: Statistics South Africa: Financial census of municipalities / Annual financial statistics survey

On average, all sectors reflected an increase in the carrying value of property, plant, and equipment between the financial years ending June 2013 and 2017. This increase in the carrying of property, plant, and equipment is as a result of capital expenditure. According to international accounting standards, this type of expenditure is added to the carrying value of the asset if the expenditure extends the useful life of the asset, improves efficiency of operations or provides some other improvement in economic benefit to the company. Thus, an increase in the carrying

value of property, plant, and equipment represents an increase in economic benefits that accrual to a company, these economic benefits relate to an entity's objectives.

The total carrying value of municipal property, plant, and equipment increased by an average of 7.7 % between the financial year ending 2013 and 2017 and an average increase of 6.8% between the period 2015 and 2017. However, the carrying value of water and electricity assets between 2015 and 2017 reflected an average decrease of 5.9% for the value of electricity assets and an average increase of 0.6% for the value of water assets. This is an indication that growth in the carrying value of municipal property, plant and equipment is mainly as a result of capital expenditure occurring within other municipal assets such as buildings, roads, community assets and other infrastructure assets.

This is concerning when taking into consideration current backlogs that exist in the provision of basic services. According to the community survey 2016, 10.1% of households have no access to piped water, 36.6% no sanitation services, 39.0% no solid waste services and 12.4% no services regarding electricity. The 5.9% average decrease in the value of electricity assets and a minimum average increase of 0.6% in the value of water assets is an indication funding has been limited in these asset categories. As a result, this influences the ability of the infrastructure asset to deliver the intended functionality at the required performance while satisfying various stakeholder needs. Insufficient relevant capital expenditure that increases the carrying value of water and electricity infrastructure is further supported by the ongoing service delivery protests.

Closely related to the carrying value of property, plant, and equipment specifically water and electricity assets is the ability of municipalities to utilise their assets to generate sales. The value generated by infrastructure assets in relation to the economic benefits that flow to a local government institution can be determined by the ability of the asset to deliver the intended functionality at the required levels of performance while satisfying various stakeholder objectives (Srinivasan & Parlikad, 2017). These objectives mainly relate to the delivery of water and electricity, sewerage and sanitation basic services.

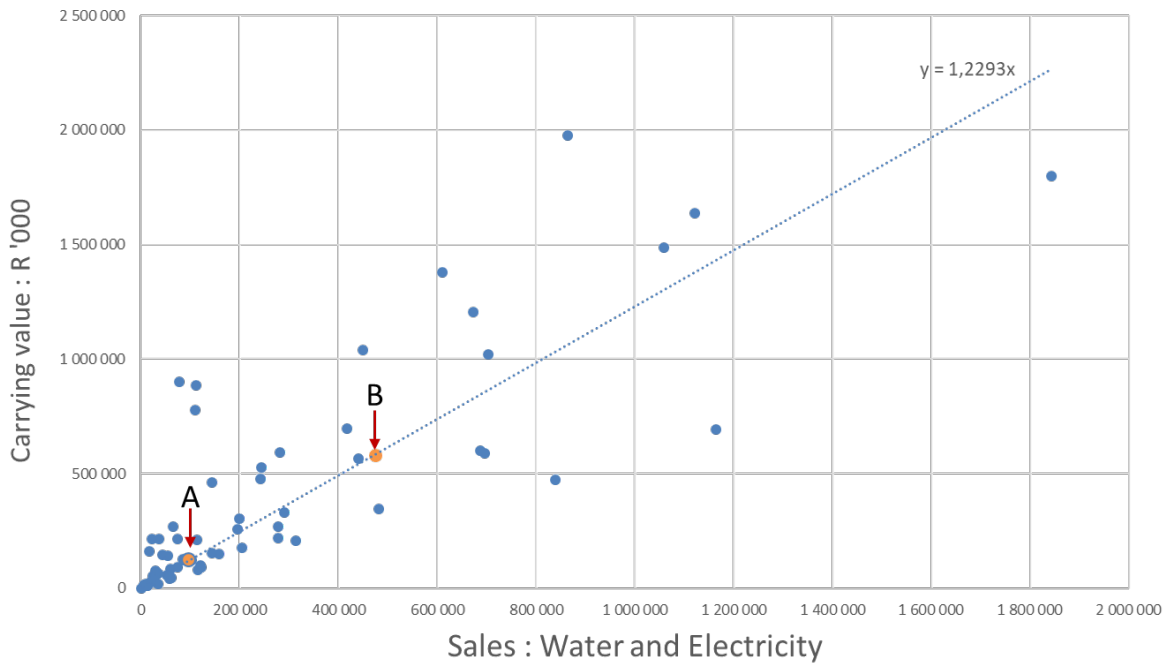
The association between the carrying value of water and electricity infrastructure and generated sales is shown in Figure 5. The cluster of data points at the bottom of the scatterplot represents smaller local municipalities, while points further away from the axis represent large

municipalities. Certain district and metropolitan municipalities were excluded due to their large values that conceal values related to smaller municipalities.

Figure 5 indicates an uphill pattern between the carrying value of water and electricity infrastructure and generated sales, indicating a positive relationship between these variables i.e. an increase in the carrying value of water and electricity infrastructure results in an increase in revenue or associated sales. For example Point B on the scatter plot indicates that the total carrying value of R577 853 million produces total sales to the value of R474 667 million, indicating a ratio of 0.82%.

The trend line shows a positive linear scatter plot representing the slope-intercept with the equation y = 1,2293x. Data points above the trend line indicate municipalities that utilize more water and electricity infrastructure in generating associated water and electricity sales. While municipalities or data points below the line, generate more sales from their utilized infrastructure assets. Points A and B on the trend line indicate the general relationship between variables, using these points the slope-intercept form is represented by the equation y = 1,2293x+b, indicating the y, representing infrastructure carrying values, tend to be large than x, representing water and electricity sales. The data points or municipalities indicated in the scatter plot that reported carrying values greater than their associated sales, represented 70.3% of municipalities. This is consistent with the study conducted by Mahabir (2014), indicating that over the five years ten municipalities maintained constant efficiency, representing 8% of the sampled units. A total of 100 municipalities or 78% of the sample were not efficient in any of the financial years reviewed. Winn (1997) further indicates that this association between carrying values and sales can be used to determine asset efficiency i.e. reflecting how well organisations utilise their assets to generate income.

Figure 5: Scatter plot: Infrastructure carrying value and sales of water and electricity: 2017



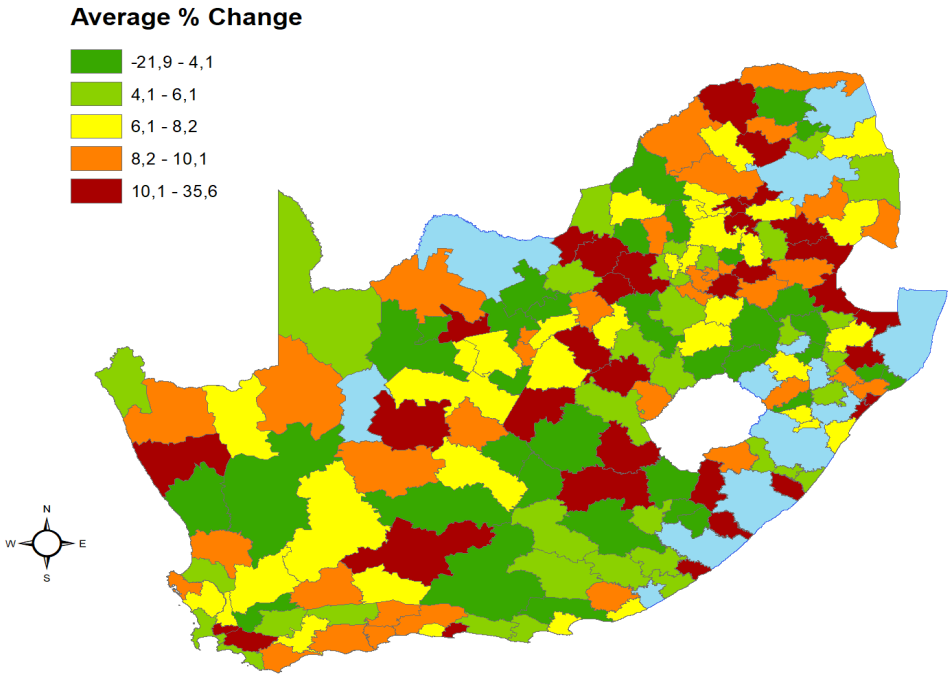
Data source: Statistics South Africa: Financial census of municipalities

Figure 6, below reflects the average percentage change in the combined sales of water and electricity between 2015 and 2018. Majority of municipalities reflected an increase in sales during this period. Municipalities reflecting a large average increase in the sales of water and electricity between 2015 and 2018 included Kamiesberg, Mbizana, Dr JS Moroka, Emakhazeni, Masilonyaha, Mafikeng, Mandeni, Ditsobotla, and Chief Albert Luthuli. These increases represent a random distribution across South Africa, as a result, quantifying outcomes cannot be isolated to specific municipalities. This random distribution or unpredictable spacing suggests that municipalities are independent of other municipalities i.e. they neither attract nor repel one another. This pattern of distribution is characterised by the lack of any strong interaction between municipalities. The random distribution of increases suggests that the fiscal autonomy of municipalities and the capabilities of municipal management influence municipal efficiency. The reasons for these increases include, but are not limited to charges increased due to the installation of new smart meters for both electricity and water, increase in bulk supply and improvements made to infrastructure.

Municipalities reflecting an average decrease in the sales of water and electricity included Renosterberg, Gamagara, Kgetlengrivier and Sunday River Valley. These are related to a large

average decrease in sales, distribution losses and electricity losses occur due to technical and non-technical losses. Technical losses refer to the inherent resistance of conductors, transformers and other electrical equipment. Non-technical losses refer to water losses occurring due to leakages, the tampering of meters, the incorrect ratios used on bulk meters, faulty meters and illegal electricity and water connections. . 37% of water in the urban piped water system leaks out or is used illegally, mainly due to ageing infrastructure (Colvin et al., 2016). National Treasury (2014) provides guidelines regarding the level of infrastructure repairs and maintenance that should occur to prevent breakdowns and interruptions to service delivery. The indicated norm of 8% is provided as a guideline, this norm represent repairs and maintenance as a percentage of property, plant and equipment. Municipal financial data indicates that repairs and maintenance as a percentage of carrying value was estimated at 3.7% for 2018 and 4.9% for 2017, well below the required 8%.

Figure 6: Percentage change in sales of water and electricity: 2015-2018

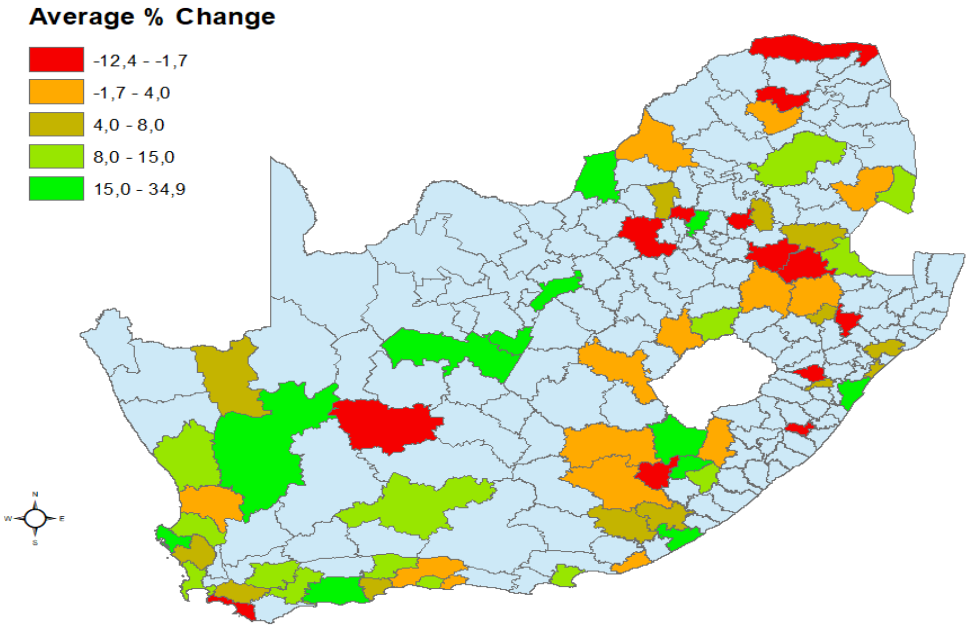


Data source: Statistics South Africa: Financial census of municipalities

Average percentage change in the carrying value of infrastructure assets that are utilised to generate sales in water and electricity is reflected in Figure 7. Averages change was calculated based on two criteria, firstly valid carrying values as reported by municipalities between 2015 and 2018, and secondly, the corresponding value for the sales of water and/or electricity. The application of the validation criteria resulted in the identification of 66 municipalities.

Municipalities reflecting an average decrease in the carrying value of water and electricity infrastructure include but not limited to Musina, Molemole, uMngeni and Kareeberg while municipalities reflecting an average increase include eThekwini, Saldanha Bay, Senqu, Siyancuma, Hantam, and Lekwa-Teemane. The distribution of these increases and decreases represents a random distribution or unpredictable spacing, this suggests that municipalities are independent of other municipalities i.e. they neither attract nor repel one another. The random distribution of increases and decreases suggests that the fiscal autonomy of municipalities and the capabilities of municipal management influence municipal efficiency. The reasons attributed to the large fluctuations in the carrying values of water and electricity infrastructure relate to additions because of aging and deteriorating infrastructure as well as illegal connections, additions to water treatment works and upgrades to bulk water services. Impairments and construction delays result in a decrease in the carrying value of infrastructure due to metering inefficiencies, aging pipeline infrastructure, burst pipes, old reticulation networks, and damage because of weather. Construction delays, work in progress and corresponding capitalised expenditure related to the expanded public works program contribute to fluctuations in the carrying value of infrastructure.

Figure 7: Percentage in carrying values of water and electricity infrastructure: 2015-2018



Data source: Statistics South Africa: Financial census of municipalities

While increases or decreases in carrying values of water and electricity infrastructure can be traced to specific reasons indicated by municipalities, these fluctuations do not address the inability of municipalities to render basic services such as housing, electricity and water which

is demonstrated by thousands of people protesting their dissatisfaction. Infrastructure assets are required to generate value by their ability to deliver the intended functionality while satisfying the needs of the various stakeholder. The proportion of consumer units utilising water and electricity infrastructure has not increased significantly, indicating no substantial improvement in the carrying value of infrastructure assets has occurred. Further, the under-spending of municipalities according to their capital budget indicating that municipalities are struggling with implementing their capital budget, a contributing factor is poor asset management and poor delivery of services.

4.3 RELATIONSHIP BETWEEN KEY VARIABLES

Given the vast amount of information contained in the detailed financial statements of municipalities, it may be difficult to determine significant relationships that exist between variables. Correlation helps to discover and quantify the degree to which variables in your dataset are dependent upon each other. This knowledge facilitates the preparation of the data to conduct further analysis such as ratio analysis, whose performance will degrade with the presence of these interdependencies between variables.

To understand the impact of invested fixed capital specifically carrying value of infrastructure assets on sales of water and electricity, a relationship needs to be established between these two variables. This can be achieved by using correlation models to understand such relationships (Innocent, Mary, & Matthew, 2013). Because of the literature review above, the researcher concludes that they are significant effects between the independent variables and the dependent variable.

Table 5 shows the results of the simple linear regression between the valid carrying value of water and electricity infrastructure assets and total associated sales. The model explains 70 percent of the variation in total sales, the adjusted R^2 is 0.70 which suggests that approximately 70 percent impact in total sales is explained by the independent variable. The remaining 30 percent is because of some other variables that require further investigation.

Table 5: Regression analysis model summary

Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.837[a]	0.701	0.697	1757356.816

a. Predictors: (Constant), TCVTWE2017

b. Dependent Variable: TSWE2017

The carrying value of water and electricity infrastructure assets has a significant relationship with total sales of water and electricity. The calculated t of total carrying value of water and electricity infrastructure, indicated in Table 6 below, is 13.429. This indicates that the carrying value has a strong positive relationship with total sales. The significance level of 0.000 shows that carrying value is statistically significant. This suggests that a significant relationship exists between the carrying value of water and electricity infrastructure assets and total sales of water and electricity.

Table 6: Coefficients: water and electricity, total sales and total carrying value

Coefficients[a]						
		Unstandardised Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	-221471.519	218890.284		-1.012	0.315
	TCVTWE2017	1.356	0.101	0.837	13.429	0.000

a. Dependent Variable: TSWE2017

The Pearson correlation coefficient was utilised to examine the correlation between variables, the correlation matrix indicated below shows the association between total sales of water and electricity (TSWE) and the total carrying value of water and electricity infrastructure (TCVWE). The values for water and electricity infrastructure assets were combined to define a total carrying value comprising of both asset categories. This was done to ensure the most reliable data is utilised during analysis. Similarly this was applied to the sales of water and electricity. These variables were combined due to recording and recognition constraints experienced by respondents. The association between these variables were determined for the financial years ending 2016, 2017 and 2018. Correlation facilitates defining the dependant or explanatory variable as total water and electricity sales while the independent variable is represented by the total carrying value of water and electricity infrastructure.

Table 7: Correlation Matrix, 2016-2017

Correlations							
		TSWE 2016	TCVTWE 2016	TSWE 2017	TCVTWE 2017	TSWE 2018	TCVTWE 2018
TSWE 2016	Pearson Correlation	1	.703**	1.000**	.678**	1.000**	.666**
	Sig. (2-tailed)		0,000	0,000	0,000	0,000	0,000
	N	257	257	257	257	257	257
TCVTWE2016	Pearson Correlation	.703**	1	.697**	.871**	.700**	.834**
	Sig. (2-tailed)	0,000		0,000	0,000	0,000	0,000
	N	257	257	257	257	257	257
TSWE 2017	Pearson Correlation	1.000**	.697**	1	.672**	1.000**	.659**
	Sig. (2-tailed)	0,000	0,000		0,000	0,000	0,000
	N	257	257	257	257	257	257
TCVTWE 2017	Pearson Correlation	.678**	.871**	.672**	1	.676**	.971**
	Sig. (2-tailed)	0,000	0,000	0,000		0,000	0,000
	N	257	257	257	257	257	257
TSWE 2018	Pearson Correlation	1.000**	.700**	1.000**	.676**	1	.664**
	Sig. (2-tailed)	0,000	0,000	0,000	0,000		0,000
	N	257	257	257	257	257	257
TCVTWE 2018	Pearson Correlation	.666**	.834**	.659**	.971**	.664**	1
	Sig. (2-tailed)	0,000	0,000	0,000	0,000	0,000	
	N	257	257	257	257	257	257

**. Correlation is significant at the 0.01 level (2-tailed).

The correlation coefficient matrix (Table 7) indicates that total water and electricity sales are positively and significantly correlated with the total carrying value of water and electricity infrastructure. This positive and significant correlation is observed for the financial years ending 2016, 2017 and 2018. The association between TSWE and TCVTWE is shown by its correlation coefficient of between 0.66-0.70 for the research period. Based on Ferrer's (2016) interpretation, the correlation between total water and electricity sales and the total carrying value of water and electricity infrastructure falls within the upper range between 0.20 and 0.80 this reflects a moderately high positive correlation. Focusing on the financial year ending 2017, the correlation indicates that the total carrying value of infrastructure explains 67.2% of total water and electricity sales. The significance of this correlation is related to the fact that asset efficiency can be achieved if the net earnings of a company increase in proportion to an increase in assets (Winn, 1997), for this determination to occur a significant relationship needs to exist

between the dependent and independent variables. In the study conducted by Monkam (2007), the need to identify efficiency determinants and the strength of relationships is critical in conducting input-out analysis. This correlation facilitates comparing a firm's income to the book value of its total assets, thereby reflecting how well its assets are used to generate income.

4.4 EFFICIENT ANALYSIS: RATIO ANALYSIS

The efficient utilisation of assets is critical in ensuring the fulfilment of business objectives, whether the objectives relate to profit generation, rising standard of living, managerial efficiency or social objectives. Effective infrastructure assets provide the means for a nation to become developed and is one of the main factors in improving competitiveness (Amador-Jimenez & Willis, 2012).

Jewell & Mankin (2011) confirms that the return on assets is one of the most popular and useful ratios. The return on asset ratio compares profits or losses generated by a business to their corresponding total assets of the business as indicated in their balance sheet. Since then the ratio has expanded to include profit compared to sales or sales compared to assets. The importance of the return on assets ratio is that it is presented in most business textbooks as a predictor of business failure and is used to investigate a firm's financial position, financial performance, and future prospects.

Jewell & Mankin (2011) further found that eleven different versions of return on assets in business textbooks, the most frequently used version compared income to total assets, the frequently used version also supported by Winn (1997). The return on assets ratio calculated in this study will conform to the most frequently used version by comparing the total carrying value of water and electricity infrastructure assets with the total sales of water and electricity for the financial years ending June 2016, 2017 and 2018.

The return on assets ratio, as a measure of municipal efficiency, is calculated for municipalities reporting valid water and electricity carrying values and total sales amounts. Valid amounts defined as values greater than zero was used as the primary criteria in compiling the return on assets ratio. Municipalities that conformed to this criteria were isolated to 88 cases in 2016 and 85 cases in 2017 and 2018 as indicated in Table 8 below.

Table 8: Return on assets ratio: Descriptive statistics

Period	N	Minimum	Maximum	Mean	Std. Deviation
ROA 2016	88	0.04	5.04	1.04	0.99
ROA 2017	85	0.03	4.88	1.04	0.95
ROA 2018	85	0.04	4.93	1.07	0.98

The return on assets financial ratio has a positive mean value that ranges between 1.04 and 1.07 for the financial years ending June 2016, 2017 and 2018. This positive mean of 1.00 indicates that for every one rand of total carrying value of water and electricity infrastructure, one rand of water and electricity sales are generated. For the financial year ending 2018, one rand in infrastructure assets were utilised to generate one rand and seven cents in sales. The higher the ratio, the more sales a municipalities generates relative to their infrastructure assets. The return of assets ratio provides an indication as to how efficiently management use assets to generate sales. According to Westhuizen & Dollery (2009) efficiency refers to the use of resources in the most efficient manner to obtain the maximum possible output from a given set of inputs.The descriptive statistics show that the standard deviation ranging between 0.95 and 0.99 indicating that the observations are fairly clustered around the mean. This does not necessarily imply municipalities are efficient in utilising assets to generate sales; this is because the mean is sensitive to extreme high values and extreme low values. The maximum calculated return on asset ratios ranged between 4.88 and 5.04 representing the most efficient municipalities in terms of generating more sales relative to their infrastructure assets. While the minimum ranged between 0.03 and 0.04 indicates least efficient municipalities in terms of generating less sales relative to their infrastructure assets. By removing exceptional large cases, i.e. return on assets financial ratio greater than two, a different picture is presented in Table 9.

Table 9: Return on assets ratio: Descriptive statistics excluding large cases

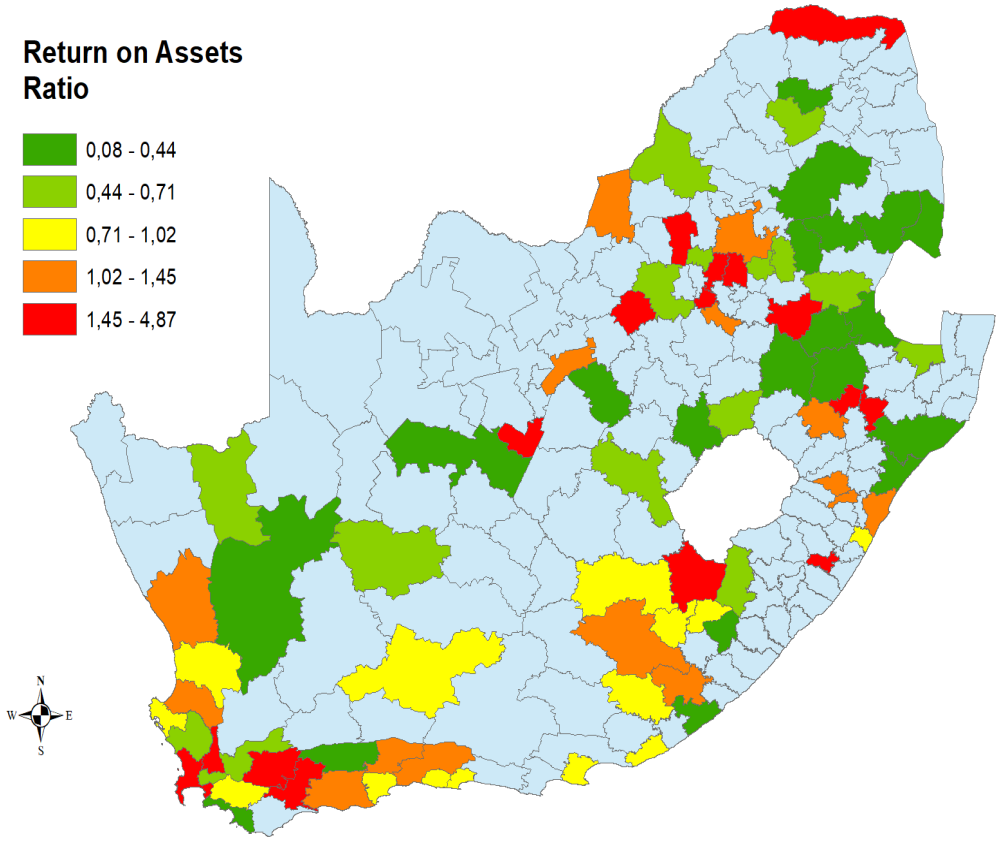
	N	Minimum	Maximum	Mean	Std. Deviation
ROA 2016	78	0.04	1.99	0.76	0.51
ROA 2017	75	0.03	1.78	0.77	0.45
ROA 2018	75	0.04	1.96	0.80	0.50

The mean remains positive at values ranging between 0.76 and 0.80 for the financial years ending June 2016, 2017 and 2018 but represents a decreased in the mean between 25 and 27 percent when compared to Table 8. For the financial year ending 2017, this indicates that for

every one rand of total carrying value of water and electricity infrastructure, seventy-seven cents of water and electricity sales are generated. This decrease in mean return on assets ratio implies that highly efficient municipalities are isolated to a few cases. This conforms to previous studies indicating the efficiency is isolated to certain municipalities. The standard deviation ranging between 0.45 and 0.51 indicates that the observations are much more clustered around the mean when compared to Table 8. The mode during this period ranged between 0.71 and 0.79. The convergence of the mean and mode implies exceptional cases have been removed and this represents a true reflection of the remaining observations. In table 8, the maximum calculated return on asset ratios ranged between 1.78 and 1.99 while the minimum ranged between 0.03 and 0.04.

The calculated return on asset ratios by municipality between the maximum and minimum range indicated in Table 8 is projected in Figure 8, below. These return on asset ratios are only calculated for municipalities reporting valid water and electricity carrying values and total sales amounts for 2017. The financial year ending June 2017 was deemed the most reliable as these figures were revised in the most recent financial census of municipalities' survey, the 2018 results remain preliminary.

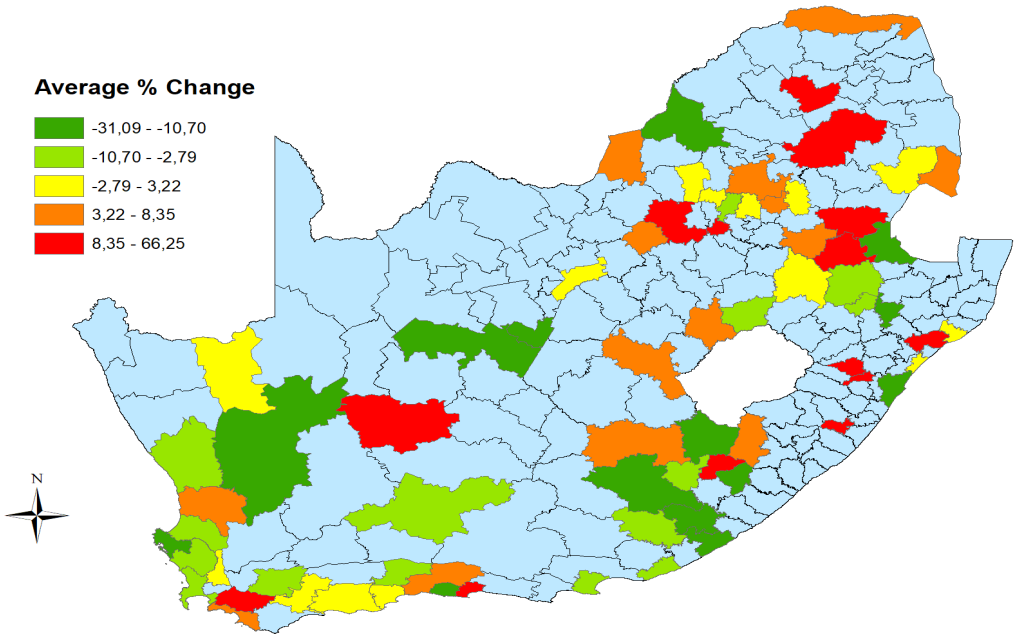
Figure 8: Financial ratio of municipalities: Return on assets, 2017



Data source: Statistics South Africa: Financial census of municipalities

Municipalities reflecting ratios above 2.00 include Musina, Rustenburg, Drakenstein, City of Ekurhuleni, City of Johannesburg, Umuziwabantu, Endumeni, and Emfuleni. While municipalities reflecting ratios below 0,20 include Joe Gqabi, Phumelela, Setsoto, Nkomazi, Tswelopele, and Emakhazeni. The return on asset ratios results conform to studies conducted by Westhuizen & Dollery (2009), Monkam (2014) and Mahabir (2014). Indicating that the difference between the most efficient and least efficient municipality are substantial and efficiency can be isolation to certain municipalities.

Figure 9: Return on assets of municipalities: average percentage change, 2016 - 2018



Data s
ource: Statistics South Africa: Financial census of municipalities

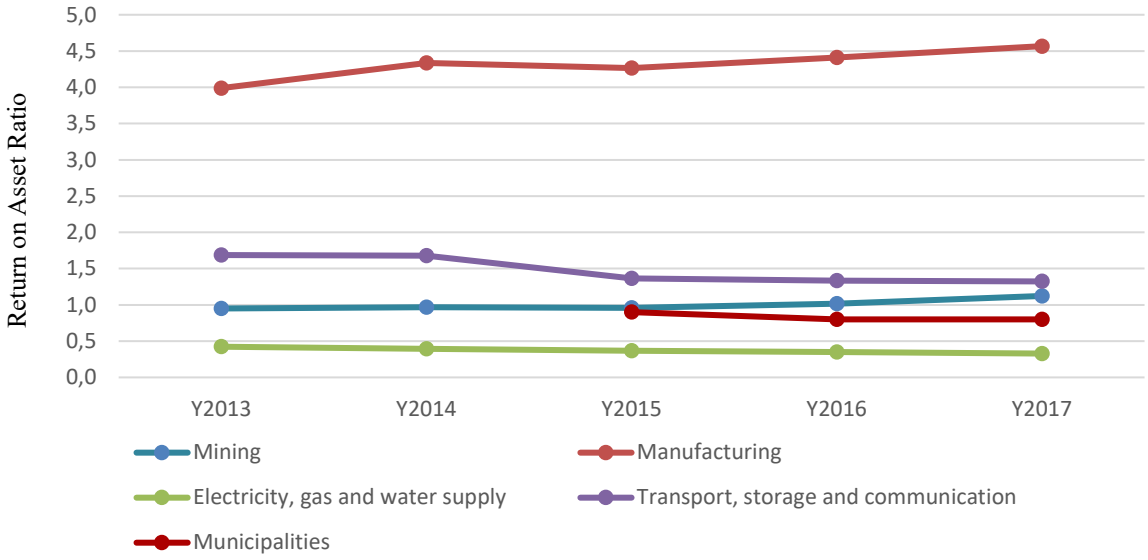
Figure 9 reflects fluctuations in the return on asset ratio between 2016 and 2018, these fluctuations indicate the degree to which efficiency in terms of utilising infrastructure assets to generate sales has improved or regressed between 2016 and 2018. This further provides evidence that the fiscal autonomy of municipalities and the capabilities of municipal management influence municipal efficiency Municipalities reflecting a positive change above 20 percent include Sekhukhune, uMngeni, Bitou, The Msunduzi, Kareeberg, Sakhisizwe, and JB Marks. While municipalities reflecting a negative change below 20 percent include Senqu, Joe Gqabi, eThekwini, Thabazimbi, Amahlathi and Buffalo City. Municipalities that maintained constant average change between 2016 and 2018 include Lekwa-Teemane, Swellendam, Phumelela and City of uMhlathuze.

4.4 FURTHER EFFICIENCY INDICATORS

Focusing on business-like efficiency, the return on assets ratio was computed for businesses operating within the private sector environment including selected state-owned enterprises. The

ratio comparison between municipalities and private sector entities were conducted between capital-intensive industries. The reason for conducting a comparison between municipalities and selected private sector entities is justified by Ezeamama (2010), who argues that ratios are most effective when compared to a standard or norm and a single ratio in itself does not indicate a favourable or unfavourable situation. The ratio has to be compared with a benchmark or standard before commenting on a specific derived ratio (Innocent et al., 2013). The industries included in the comparison are mining, manufacturing, electricity, gas and water supply and transportation, storage and communication. The variables extracted from the annual financial statistics survey for estimating the return on assets ratios included turnover and carrying values of property, plant, and equipment. These comparisons are indicated in Figure 10, below, for the financial years ending between 2013 and 2017. Municipal water and electricity infrastructure carrying values are only available from 2015 to 2017.

Figure 10: Comparison of Return on asset ratio



Data source: Statistics South Africa: Annual Financial Statistics Survey / Financial census of municipalities

This efficiency comparison between the private sector and municipalities, based on the return on asset ratio, provides insight as to how effective South Africa municipalities have utilised their infrastructure assets. This comparison facilitates the transfer of assets management tools and principles that have been developed and applied in a capital-intensive private sector. When comparing the return on asset ratios generated for both selected municipalities and private sector industries, manufacturing is the most efficient sector in terms of asset utilisation. The ratio for manufacturing can be interpreted as, for each rand of asset value, four rands in turnover

is generated. Transport, storage and communication, mining, municipalities and lastly electricity, gas and water supply follow the manufacturing industry. The sectors indicating a return on asset ratio below one are electricity, gas and water supply and local government municipalities. The return on asset ratio for the electricity, gas and water supply sector indicates that the huge investment in infrastructure and electricity generation capacity has not translated into revenue gains. Once these assets have been commissioned for use and start to generate electricity, further investigations will determine improvements related to the return on asset ratio.

The descriptive statistics contained in Table 10, indicate a summary of the return on assets ratios calculated using the annual financial statistics survey of capital-intensive industries. These ratios were calculated for businesses reporting valid property, plant and equipment carrying values and turnover amounts for 2016 and 2017. The validation criteria is that the reported values for turnover and carrying values should exceed zero to facilitate the calculation of the ratio and that the ratio calculations should only applied to large businesses to reduce the number of outliers and facilitate quality analysis.

Table 10: Return on assets ratio: Descriptive statistics for private sector

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ROA 2016	695	.079	20.68	3.38	3.28
ROA 2017	737	.060	20.60	3.62	3.47

In Table 10, the return on assets financial ratio as a measure of private-sector efficiency has a positive mean value that ranges between 3.38 and 3.62 for the financial years ending June 2016 and June 2017. This high positive mean of 3.62 for the financial year ending 2017, indicates that for every one rand of asset values, three rand and sixth two cents of sales are generated. The higher the ratio, the more sales are generated relative to assets. The return of assets ratio mean provides an indication of the efficiency gap that exists between the private sector and municipalities. Should municipalities wish to focus on business-like efficiency then substantial reforms are required concerning management use assets to generate sales. The descriptive statistics show that the standard deviation for 2016 is at 3.28 while for 2017 a standard deviation of 3.47 was obtained. This indicates that the observations for 2016 and 2017 are consistently dispersed around the mean when compared to standard deviations obtain for municipalities.

CHAPTER 5: CONCLUSION

While various legislative and policy frameworks exist, the evidence contained in the literature review indicates that the majority of municipalities inefficiently utilize resources. This inefficiency is substantiated by the general decrease in the provision of free basic services, failure of municipalities to adapt to the changing needs of society, the concerns raised regarding the financial health of municipalities, poor financial management related to budgeting and execution of budgets. Lastly, the most significant and compelling evidence is the failure to address services delivery backlogs. The total number of households estimated in the latest community survey is 16 million, from this total 10.1% do not have access to piped water, 36.6% have limited sanitation services, 30.9% have limited solid waste services and 12.4% have limited electricity services.

Inefficiencies within municipalities are further supported by studies conducted by Mahabir (2014), Westhuisen and Dollery (2009), Monkam (2014) and Mbonigaba & Oumar (2014). Based on these studies and the varying degree of backlogs that exist across municipalities including the different financial health status of municipalities, efficiency is isolated to certain municipalities. The plausible explanation for this random distribution of efficiency relates to the fiscal autonomy of municipalities and the capabilities of municipal management in addressing service delivery challenges.

Assets under the control and ownership of municipalities, specifically property, plant, and equipment represent a significant proportion when compared to assets contained within the private sector. These significant infrastructure amounts require efficient management, unfortunately, growth rates within property, plant, and equipment seem to be more aligned towards non-basic services infrastructure. This misalignment influences the ability of municipalities to render basic services and results in a widening gap between community needs and actual expenditure in addressing service delivery backlogs. Contributing to this gap is the inability of municipalities to spend capital budgets, during the 2016/2017 financial year-end under-spending of capital budgets amounted to R14 439 billion.

The close association between the carrying value of water and electricity infrastructure and total sales facilitates the computation of the return on assets ratio. The return on assets ratio as a measure of municipal efficiency indicates that while a positive mean does exist, municipalities tend to function on different efficiency levels. The difference between the most

efficient and least efficient municipalities are substantial and can be isolated to certain municipalities being classified as very efficient. The average percent change in efficiency levels suggests that nearly 50 percent of municipalities reflected a decrease in the return on assets ratio implying a decrease in municipal efficiency between 2016 and 2018. According to this study, the value of infrastructure represented by municipalities that are inefficient i.e. return on asset ratio less than one amounted to just over R 40 billion for the financial year-end June 2017. When comparing the municipal return on asset ratios to selected capital-intensive private sector businesses, the efficiency gap is significantly large. This indicates that substantial reforms are required within municipalities should they wish to focus on business-like efficiency.

It has been determined that fluctuations in key variables i.e. the carrying value of infrastructure assets and total water and electricity sales and related reasons are randomly distributed suggesting that municipalities are independent of other municipalities. The random distribution further suggests that the fiscal autonym of municipalities and the capabilities of municipal managers influence municipal efficiency; this is consistent with evidence obtained from the literature review. This raises a critical question that requires further research i.e. should fiscal autonyms of municipalities continue to exist.

According to this study, the highly efficient municipalities in terms of asset utilisation can serve as a benchmark for inefficient municipalities. The ability to rank municipalities facilitates an environment in which municipalities can learn from each other's practices. A survey of factors that result in reduced inefficiencies in municipalities can be used to compile guidelines for the best practices for all municipalities.

Further policy implications include the need to review the relevance and successfulness of integrated development plans by incorporating specific target settings concerning assets utilisation and management. Encourage public private-partnerships and shared services in an attempt to improve service delivery and the delivery of improved infrastructure that will attract investors and devise more ways of subsidising services provided, as the demand tends to exceed the supply of basic services.

Mbonigaba & Oumar (2014) recommend that for a problem as important as the inefficiency of municipalities in South Africa, the number of studies is limited. The persistent problems associated with service delivery demands further studies to be undertaken analysing the

efficiency of local government institutions. This need is also supported by evidence that the fiscal autonomy of municipalities and the capabilities of municipal management influence municipal efficiency. This study presents the return on assets ratio as a measure of municipal efficiency, what this study did not explore was factors that contribute to and explain the different level of inefficiencies across municipalities.

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